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Gynecology and Obstetrics

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Contents

Surgical Documentation for Gynecology

Gynecologic Surgical History

Identifying Data. Age, gravida (number of pregnancies), para (number of deliveries).

Chief Compliant. Reason given by patient for seeking surgical care.

History of Present Illness (HPI). Describe the course of the patient's illness, including when it began, character of the symptoms; pain onset (gradual or rapid), character of pain (constant, intermittent, cramping, radiating); other factors associated with pain (defecation, urination, eating, strenuous activities); aggravating or relieving factors. Other related diseases; past diagnostic testing.

Obstetrical History. Past pregnancies, durations and outcomes, preterm deliveries, operative deliveries, prolonged labors, preeclampsia, placental abruption or placenta previa, or blood loss requiring transfusion.

Gynecologic History: Last menstrual period, length of regular cycle, birth control.

Past Medical History (PMH). Past medical problems, previous surgeries, hospitalizations, diabetes, hypertension, asthma, heart disease.

Medications. Aspirin, anticoagulants, cardiac medications.

Allergies. Penicillin, codeine.

Family History. Medical problems in relatives.

Social History. Alcohol, smoking, drug usage, occupation.

Review of Systems (ROS):

General: Fever, fatigue, night sweats.

HEENT: Headaches, masses.

Respiratory: Cough, sputum, hemoptysis, dyspnea on exertion.

Cardiovascular: Chest pain, extremity edema.

Gastrointestinal: Vomiting, abdominal pain, melena (black tarry stools), hematochezia (bright red blood per rectum).

Genitourinary: Dysuria, hematuria, discharge.

Skin: Easy bruising, bleeding tendencies.

Gynecologic Surgical Physical Examination

Vital Signs: Temperature, respirations, heart rate, blood pressure, weight.

Eyes: Pupils equally round and react to light and accommodation (PERRLA); extraocular movements intact (EOMI).

Neck: Jugular venous distention (JVD), thyromegaly, masses, lymphadenopathy.

Chest: Equal expansion, rales, breath sounds.

Heart: Regular rate and rhythm (RRR), first and second heart sounds, murmurs.

Breast: Skin retractions, masses (mobile, fixed), erythema, axillary or supraclavicular node enlargement.

Abdomen: Scars, bowel sounds, masses, hepatosplenomegaly, guarding, rebound, costovertebral angle tenderness, abdominal hernias.
Genitourinary: Inguinal hernias, urethral discharge, uterus, adnexa, ovaries, cervix.
Extremities: Cyanosis, clubbing, edema.
Neurological: Mental status, strength, tendon reflexes, sensory testing.
Laboratory Evaluation: Electrolytes, glucose, liver function tests, PT/PTT, CBC with differential; X-rays, ECG (if >35 yrs or cardiovascular disease), urinalysis.
Assessment (Impression): Assign a number to each problem and discuss each problem separately.
Plan: Describe surgical plans for each numbered problem, including preoperative testing, laboratory studies, medications, and antibiotics.

Preoperative Note

Preoperative Diagnosis:
Procedure Planned:
Laboratory Data: Electrolytes, BUN, creatinine, CBC, liver function tests, PT/PTT, UA, EKG, chest X-ray; type and screen for blood or cross match.
Consent: Document explanation of risk and benefits of procedure to patient, and document patient's informed consent and understanding of the procedure.
Allergies:
Major Medical Problems:
Medications:

Brief Operative Note

Date of the Procedure:
Preoperative Diagnosis:
Postoperative Diagnosis:
Procedure:
Operative Findings:
Names of Surgeon and Assistant:
Anesthesia: General, spinal, or epidural.
Estimated Blood Loss (EBL):
Fluids and Blood Products Administered:
Urine output:
Specimens: Pathology specimens, cultures, blood samples.
Drains:

Operative Report

Identifying Data: Name of patient, medical record number; name of dictating physician, date of dictation.
Attending Surgeon and Service:
Date of Procedure:
Preoperative Diagnosis:
Postoperative Diagnosis:
Procedure Performed:
Names of Surgeon and Assistants:
Type of Anesthesia Used:
Estimated Blood Loss (EBL):
Fluid and Blood Products Administered:
Specimens: Pathology, cultures, blood samples.
Drains and Tubes Placed:
Complications:
Indications for Surgery: Brief history of patient and indications for surgery.
Findings:
Description of Operation: Position of patient; skin prep and draping; location and types of incisions; details of procedure from beginning to end including description of findings, both normal and abnormal, during surgery. Hemostatic and closure techniques; dressings applied. Patient's condition and disposition. Needle and sponge counts as reported by operative nurse.
Copies: Send copies of report to surgeons.

Post-Operative Orders

1. **Transfer:** From recovery room to surgical ward when stable.
2. **Vital Signs:** q4h x 24h.
3. **Activity:** Bed rest; ambulate in 8 hours if tolerated. Incentive spirometer q1h while awake.
4. **Diet:** NPO x 8h, then sips of water. Advance to clear liquids, then to regular diet as tolerated.
5. **IV Fluids:** IV D5 LR or D5 1/2 NS at 125 cc/h with KCL, 20 mEq/L, Foley to gravity.
6. **Medications:**
   Cefazolin (Ancef) 1 gm IVPB q8h x 3 doses; if indicated for prophylaxis in clean cases.
   Meperidine (Demerol) 50-75 mg IM or IV q3-4h prn pain.
   Hydroxyzine (Vistaril) 25-50 mg IM q3-4h prn pain **OR**
   Prochlorperazine (Compazine) 10 mg IV or IM q4-6h prn nausea.
7. **Laboratory Evaluation:** CBC, SMA7 in AM.

Problem-Oriented Surgical Progress Note

Problem List: Post-operative day number, antibiotic day number. List each problem separately (eg, status-post hysterectomy).
Subjective: Describe how the patient feels, and give observations about the patient.
Objective: Vital signs, physical exam for each system, examination and description of wound. Condition of dressings, drainage, granulation tissue, erythema; condition of sutures, dehiscence. Amount and color of drainage, laboratory data.
Assessment: Evaluate each numbered problem separately.
Plan: For each numbered problem, discuss any additional orders or surgical plans. Discuss changes in drug regimen or plans for discharge or transfer.

Discharge Summary

Patient's Name:
Chart Number:
Date of Admission:
Date of Discharge:
Admitting Diagnosis:
Discharge Diagnosis:
Name of Attending or Ward Service:
Surgical Procedures:
Brief History and Pertinent Physical Examination and Laboratory Data: Describe the course of the disease up to the time the patient came to the hospital, and describe the physical exam and laboratory data on admission.
Hospital Course: Describe the course of the patient's illness while in the hospital, including evaluation, treatment, outcome of treatment, and medications given.
Discharged Condition: Describe improvement or deterioration in condition.
Disposition: Describe the situation to which the patient will be discharged (home, nursing home).
Discharged Medications: List medications and instructions.
Discharged Instructions and Follow-up Care: Date of return for follow-up care at clinic; diet, exercise instructions.
Problem List: List all active and past problems.
Copies: Send copies to attending physician, clinic, consultants and referring physician.

Total Abdominal Hysterectomy and Bilateral Salpingo-oophorectomy Operative Report

Preoperative Diagnosis: 45 year old female, gravida 3 para 3, with

menometrorrhagia unresponsive to medical therapy.

Postoperative Diagnosis: Same as above

Title of Operation: Total abdominal hysterectomy and bilateral salpingo-oophorectomy

Surgeon:

Assistant:

Anesthesia: General endotracheal

Findings At Surgery: Enlarged 10 x 12 cm uterus with multiple fibroids. Normal tubes and ovaries bilaterally. Frozen section revealed benign tissue. All specimens sent to pathology.

Description of Operative Procedure: After obtaining informed consent, the patient was taken to the operating room and placed in the supine position, given general anesthesia, and prepped and draped in sterile fashion.

A Pfannenstiel incision was made 2 cm above the symphysis pubis and extended sharply to the rectus fascia. The fascial incision was bilaterally incised with curved Mayo scissors, and the rectus sheath was separated superiorly and inferiorly by sharp and blunt dissection. The peritoneum was grasped between two Kelly clamps, elevated, and incised with a scalpel. The pelvis was examined with the findings noted above. A Balfour retractor was placed into the incision, and the bowel was packed away with moist laparotomy sponges. Two Kocher clamps were placed on the cornua of the uterus and used for retraction.

The round ligaments on both sides were clamped, sutured with #0 Vicryl, and transected. The anterior leaf of the broad ligament was incised along the bladder reflection to the midline from both sides, and the bladder was gently dissected off the lower uterine segment and cervix with a sponge stick.

The retroperitoneal space was opened and the ureters were identified bilaterally. The infundibulopelvic ligaments on both sides were then doubly clamped, transected, and doubly ligated with #O Vicryl. Excellent hemostasis was observed. The uterine arteries were skelatinized bilaterally, clamped with Heaney clamps, transected, and sutured with #O Vicryl. The uterosacral ligaments were clamped bilaterally, transected, and suture ligated in a similar fashion.

The cervix and uterus was amputated, and the vaginal cuff angles were closed with figure-of-eight stitches of #O Vicryl, and then were transfixed to the ipsilateral cardinal and uterosacral ligament. The vaginal cuff was closed with a series of interrupted #O Vicryl, figure-of-eight sutures. Excellent hemostasis was obtained.

The pelvis was copiously irrigated with warm normal saline, and all sponges and instruments were removed. The parietal peritoneum was closed with running #2-O Vicryl. The fascia was closed with running #O Vicryl. The skin was closed with stables. Sponge, lap, needle, and instrument counts were correct times two. The patient was taken to the recovery room, awake and in stable condition.

Estimated Blood Loss (EBL): 150 cc

Specimens: Uterus, tubes, and ovaries

Drains: Foley to gravity

Fluids: Urine output - 100 cc of clear urine

Complications: None

Disposition: The patient was taken to the recovery room in stable condition.

General Gynecology

Management of the Abnormal Pap Smear

I. Screening for Cervical Cancer

A. The American Cancer Society currently recommends annual Pap smears for women who are sexually active or who have reached the age of 18.

B. After three consecutive satisfactory, normal smears, testing may be performed less frequently, but it should be performed at least every 2-3 years. If a woman has had SIL on any previous Pap smear, annual smears should be performed throughout her life.

II. Management of Minor Pap Smear Abnormalities

A. Satisfactory, but Limited by Few (or absent) Endocervical Cells

1. Endocervical cells are absent in up to 10% of Pap smears pre-menopause and up to 50% postmenopausally.

2. Management. Either repeat Pap annually or only recall women with previously abnormal Pap smears.

B. Unsatisfactory for Evaluation

1. Repeat Pap smear midcycle in 6-12 weeks.

2. If atrophic smear, treat with estrogen cream for 6-8 weeks, then repeat Pap smear.

C. Benign Cellular Changes

1. Infection-Candida

a. Most cases represent asymptomatic colonization.

b. Treatment is offered for symptomatic cases. Repeat Pap at usual interval.

2. Infection-Trichomonas. If wet preparation is positive, treat with metronidazole (Flagyl), then continue annual Pap smears.

3. Infection-Predominance of Coccobacilli consistent with Shift in Vaginal Flora

a. This finding implies possible bacterial vaginosis, but is non-specific.

b. Diagnosis should be confirmed by findings of a homogeneous vaginal discharge, positive amine test, and clue cells on micro-scopic saline suspension.

4. Infection-Herpes Simplex Virus

a. Pap smear has poor sensitivity but good specificity for HSV; a positive smear usually is caused by asymptomatic infection.

b. Inform patient of pregnancy risks and possibility of transmission.

c. No treatment is necessary. Repeat Pap as for a benign result.

5. Inflammation on Pap Smear

a. Mild inflammation on an otherwise normal smear does not need further evaluation.

b. Moderate or severe inflammation should be evaluated with a saline preparation, KOH preparation, and gonorrhea and Chlamydia test. If the source of infection is found, treatment

should be provided, and repeat Pap smear is done every 6 to 12 months. If no etiology is found, a repeat Pap smear in 6 months.

c. Infrequently, inflammation may be the only manifestation of high-grade squamous intraepithelial lesions (HGSIL) or even invasive cancer; therefore, persistent inflammation is an indication for colposcopy.

6. Atrophy with Inflammation

a. Common in post-menopausal women or in those with estrogen-deficiency states.

b. Atrophy may be treated with vaginal estrogen for 4-6 weeks, then repeat Pap smear.

7. Hyperkeratosis and Parakeratosis

a. Parakeratosis is defined as dense nuclei within a keratin layer. When no nuclei are present, the cells are designated hyperkeratotic.

b. Parakeratosis and hyperkeratosis occur as a reactive mechanism to physical, chemical, or inflammatory trauma, and it may clinically appear as leukoplakia. Benign-appearing parakeratosis or hyperkeratosis requires only a repeat Pap test in 6 months. When the finding persists, colposcopy is indicated.

III. Management of Squamous Cell Abnormalities

A. Atypical Squamous Cells of Undetermined Significance (ASCUS)

1. Indicates cells with nuclear atypia, but not due to human papilloma virus (HPV).

2. A Pap smear should be obtained every 6 months for 2 years. Annual Pap smears may be instituted after 3 consecutive satisfactory, negative smears. A repeat ASCUS smear within 2-years requires colposcopic evaluation.

3. ASCUS associated with severe inflammation and an identifiable cause of infection can be managed by treating the infection and re-evaluating the patient in 4-6 months with a repeat Pap smear. If ASCUS persists, colposcopy should be performed.

4. ASCUS in a postmenopausal patient may be secondary to vaginal atrophy. The patient should be treated with intravaginal estrogen cream for four weeks (even if the patient is receiving oral estrogen), followed by a repeat Pap smear. Colposcopy should be performed if ASCUS persists.

5. ASCUS with a qualification favoring a neoplastic process (SIL) should be evaluated with colposcopy.

6. ASCUS in a noncompliant patient or in a patient with a history of SIL on a previous Pap smear should be evaluated with colposcopy.

B. Low-Grade Squamous Intraepithelial Lesions (LSIL)

1. LSIL includes HPV and CIN 1 (or mild dysplasia). Koilocytotic atypia is indicative of HPV.

2. Pap smear should be repeated every 6 months for 2 years. If 3 consecutive Pap smears are negative, annual Pap smears can then be performed. If LSIL recurs on a subsequent smear within 2 years, or if subsequent smears reveal a high-grade squamous intraepithelial

lesion (HGSIL), the patient should receive colposcopic evaluation.

3. LSIL has a high spontaneous resolution rate, so expectant management is reasonable; however, approximately 20% of patients with LSIL will be found to have CIN 2 or 3 on biopsy.
4. LSIL, alternatively, may be followed-up with immediate colposcopy, endocervical curettage, and directed biopsy.

C. High-Grade Squamous Intraepithelial Lesion (HGSIL; moderate/severe dysplasia; CIN 2, CIN 3, carcinoma in situ). These findings must be evaluated by colposcopy and directed biopsy.

IV. Management of Glandular Cell Abnormalities

A. Endometrial Cells on Pap Smear

1. When a Pap smear is performed during menstruation, endometrial cells may be present. However, endometrial cells on a Pap smear performed during the second half of the menstrual cycle or in a postmenopausal patient may indicate polyps, hyperplasia, or endometrial adenocarcinoma.
2. An endometrial biopsy should be considered in these women.

B. Atypical Glandular Cells of Undetermined Significance (AGUS)

1. A colposcopic examination, repeat Pap smear, and endocervical sampling should be performed.
2. If the cells are of endometrial origin, an endometrial biopsy, a fractional D&C, or a diagnostic hysteroscopy should be performed.

C. Adenocarcinoma. This diagnosis requires evaluation that may include endocervical curettage, cone biopsy, and/or endometrial biopsy.

V. Colposcopically Directed Biopsy

A. Liberally apply a solution of acetic acid 3-5% to cervix, and inspect cervix for abnormal areas (white epithelium, punctation, mosaic cells, atypical vessels). Obtain biopsies of any abnormal areas under colposcopic visualization. Record location of each biopsy.

B. Monsel solution may be applied to stop bleeding.

C. Endocervical Curettage is done routinely during colposcopy, except during pregnancy.

VI. Treatment Based on Biopsy Findings

A. Benign Cellular Changes (infection, reactive inflammation). Treat infection. Repeat smear every 4-6 months; after 2 negatives, repeat yearly.

B. Treatment of Squamous Intraepithelial Lesions

1. **Condyloma Acuminata.** Use either cryotherapy or electrosurgical loop excision.
2. **Low Grade Squamous Intraepithelial Lesions (LSIL)**
   - **a. Conservative Approach.** Since the risk of progression is at most 20% and the lesion is not dangerous until it progresses, these lesions may be followed with repeat Pap smear at 4-6 month intervals until there is evidence of progression to HGSIL or persistence of low grade SIL.
   - **b.** If the untreated lesion does not resolve after a year, reevaluation by colposcopy, biopsy, and ablation are indicated.

3. **High Grade Squamous Intraepithelial Lesion (or treated LSIL)**
   a. Ablative therapy is completed to destroy the entire transformation zone.
   b. Ablation is appropriate if the entire lesion and transformation zone are seen and endocervical curettage is negative. After ablation, Pap smears are scheduled at 3-month intervals for 1 year.

C. **Electrosurgical Loop Excision (LEEP)** is used by 85% of gynecologists for cervical ablation because it is more effective than cryotherapy, fast, and well tolerated.

D. **Cryotherapy Double Freeze Technique**
   1. Freeze with a lubricated liquid nitrogen probe for 3 minutes, followed by a 4-5 minute pause, repeat freeze for 3 min.
   2. The entire lesion should be frozen, and a 3 mm margin of freeze should be visualized.

E. **Cone Biopsy** is indicated for patients with an unsatisfactory colposcopy or positive endocervical curettage.

Contraception

I. **Oral Contraceptives**

A. Monophasic OCs contain a constant dose of estrogen and progestin. Phasic OCs alter the dose of the progestin and (in some formulations) the estrogen component with the aim of reducing metabolic effects.

B. Progestins include norethindrone, levonorgestrel, norgestrel, norethindrone, and ethynodiol. Two new, less androgenic progestins are norgestimate and desogestrel.

C. OCs can be used safely until menopause by women who do not have any medical contraindications and who are nonsmokers.

D. Smoking with OC use increases the risk of myocardial infarction, stroke, and thromboembolic disease, particularly among women older than 35.

E. **Contraindications to Oral Contraceptives**
   1. Carcinoma of the endometrium or other known or suspected estrogen-dependent neoplasia
   2. Cerebrovascular or coronary artery disease
   3. Cholestatic jaundice of pregnancy or jaundice with prior pill use
   4. Heavy cigarette smoking (>15 cigarettes per day) in women older than 35
   5. Hepatic adenomas or carcinomas
   6. History of deep vein thrombophlebitis or thromboembolic disorders
   7. Known or suspected carcinoma of the breast
   8. Known or suspected pregnancy
   9. Undiagnosed abnormal genital bleeding

F. **Administration of Oral Contraceptives**
   1. **Most younger patients** can be started on Triphasil-28, LoEstrin 1.5/30, Ortho-Novum 7/7/7, Ortho-Cept, Desogen, Ortho-Cyclen, or Ortho Tri-Cyclen.

2. **Patient Instructions**
   a. Begin pill on first Sunday after period starts.
   b. If missed pill, take forgotten pill as soon as remembered and take next pill as scheduled.
   c. If 2 missed pills, take 2 pills per day for 2 days, and use backup method for that month.
   d. If 3 missed pills, discontinue the pills and allow withdrawal bleed; resume after 1 week with new pack.

G. **Breakthrough Bleeding** does not pose a health threat, but it is the most frequent complaint among OC users. Breakthrough bleeding becomes much less common after 3 months, and it may be caused by missing pills.
   1. If bleeding is occurring early in cycle, change to a lower progesterone (Brevicon, Ovcon 35, Ortho Novum 1/50). If bleeding occurs late in cycle, change to lower estrogen (LoOvral, LoEstrin 1/20).
   2. If the BTB is prolonged, regardless of where it occurs in the cycle, estrogen (Premarin) 1.25 mg, given daily for a week when the bleeding is present, will reduce bleeding.

H. **Acne and Hirsutism.** Desogen, Ortho-Cept, Demulen, Ortho-Cyclen, Modicon, Ovcon-35, and Brevicon are useful because they are less androgenic.

I. **Weight Gain.** Ortho-Cept, Desogen, Ortho-Cyclen, Triphasil, Ortho-Novum 7/7/7 or Jenest 28 may cause less weight gain because they are less androgenic.

J. **Headache.** Some women experience headaches that usually subside after the first 3 cycles. If headaches persist after 3 months, switching to LoEstrin 1/20, LoEstrin 1.5/30, Ortho-Cept, or Desogen may be useful.

K. **Nausea** is a common problem. The severity usually declines over the first several months of OC use. Taking the pill at bedtime with food often provides relief. If nausea persists, a preparation with lower progesterone may reduce nausea (Brevicon, Ovcon 35, Modicon).

L. **Amenorrhea**
   1. Amenorrhea may occur with long-term OC users. Although not medically harmful, pregnancy testing and reassurance may be necessary.
   2. If the patient continues to be bothered by the amenorrhea, oral estrogen 1.25 mg, taken with each of the 21 active OC tablets, often will restore withdrawal bleeding. Alternatively, another low-dose combination OC can be prescribed.

M. **Hypertension**
   1. OCs can cause an increase in blood pressure in some women and it should be monitored annually.
   2. Lower progesterone pills (Brevicon, Ovcon 35, Modicon) should be used; the OCP is discontinued if hypertension does not resolve.

N. **Other Common Problems**
   1. **Ovarian Cysts.** Use a monophasic preparation instead of lower dose triphasic preparations.
   2. **Breast Tenderness.** Decrease the progesterone component (Brevicon, Ovcon 35, Modicon).

3. **Fibrocystic Breast Changes.** A pill with lower estrogen should be used (LoEstrin, Lo/Ovral, Ortho-Cept).

II. Injectable Depot Medroxyprogesterone Acetate (DMPA)

A. DMPA acts by inhibiting ovulation; efficacy is extremely high.

B. DMPA is given every 3 months, and it should be initiated within 5 days of the onset of menses, otherwise a back-up method is necessary for the first 2 weeks. This approach ensures that the patient is not pregnant and prevents ovulation during the first month of use.

C. After a 150-mg injection of DMPA, ovulation does not occur for at least 3 months and 2 weeks. Therefore, a 2-week grace period exists for women receiving injections every 3 months. For women more than 2 weeks late for their injection, pregnancy should be excluded before giving the injection.

D. Return of fertility will be delayed following discontinuation in 50% of women for up to 10 months after the last injection. Women who want to become pregnant within the next 1 or 2 years should not use DMPA.

E. Side Effects

1. Episodes of irregular bleeding and spotting are common during the first months of use. With increasing duration of use, these episodes diminish, and amenorrhea becomes common. Half of women using DMPA for 1 year have amenorrhea.
2. Bleeding may be reduced by a short course of oral estrogen (Premarin), 1.25 mg administered daily for 7 days. A second option is a trial of a non-steroidal anti-inflammatory agent, which sometimes diminishes flow.
3. Headaches, bloating of the abdomen or breasts, mood changes, and weight gain occur often.

F. Benefits

1. The tendency of DMPA to cause amenorrhea can make it useful for women with menorrhagia, dysmenorrhea, or iron deficiency anemia.
2. Some women choose DMPA because its use can be concealed from the her partner.

III. Contraceptive Implants

A. Norplant VI (levonorgestrel) implants consist of six, 34 x 2.4 mm, soft plastic implants. Effectiveness lasts 5 years.

B. The Norplant II system consists of two implants, and it is effective for 3 years.

C. These systems provide a long-acting, reversible, progestin-only method of contraception.

D. Insertion of implants within 7 days of the onset of menses ensures that the patient is not pregnant and results in immediate contraception. Insertion can be performed at any time during the menstrual cycle as long as pregnancy can be ruled out.

E. Because there is no demonstrated increased risk in thromboembolic phenomena, the implants and injectables, can all be used immediately post-partum, and they do not have an adverse effect on breast feeding.

F. Side Effects

1. Most women experience irregular bleeding during the first year; this

proportion declines to one third by the fifth year.

2. One third of women experience regular cycles. 5-10% of women experience amenorrhea.
3. Estrogen supplementation can be given to implant users troubled by irregular bleeding. Women who experience regular cycles are of higher risk of pregnancy than those with irregular bleeding or amenorrhea. Pregnancy testing is indicated should menses cease.
4. Some women using implants develop ovarian cysts. Although such cysts may cause lower abdominal discomfort, more often they are asymptomatic and noted incidentally during pelvic examination. These cysts usually resolve spontaneously and are managed expectantly. Women who have experienced problematic ovarian cysts in the past, may be happier with methods that effectively suppress ovulation (combined OCP's and Depo-Provera).
5. Other side effects include weight gain, acne, headache, depression, anxiety, mastalgia, and galactorrhea.

IV. Intrauterine Devices

A. The IUD is the number one temporary contraception method used worldwide. IUD users report being more satisfied with their choice of method than users of other contraceptives.

B. An increased risk of infection with the modern IUD is related only to the insertion. IUDs do not increase the risk of ectopic pregnancy.

C. Mechanism of Action

1. IUDs-create an intrauterine environment that is spermicidal by provoking an inflammatory reaction which is toxic to sperm and to implantation. The IUD is not considered an abortifacient.
2. Progestin-releasing IUDs also thicken cervical mucus.

D. Progestasert

1. T-shaped IUD composed of a vertical stem that holds 38 mg of progesterone.
2. This IUD must be replaced at yearly intervals (effective for 18 months).

E. T Cu 380A (ParaGard). A T-shaped frame holding 380 mg of copper. The use period is 10 years.

F. Contraindications to IUD Use

1. Active, recent or recurrent pelvic inflammatory disease
2. Known or suspected gonorrhea or Chlamydia
3. Known or suspected pregnancy
4. Undiagnosed irregular or abnormal genital bleeding
5. Cervical or uterine malignancy (including unresolved PAP smear abnormalities)

G. Relative Contraindications to IUD Use

1. Increased risks for PID (frequent partners, impaired immunity)
2. HIV infection or risk factors
3. Increased risk for endocarditis
4. History of ectopic pregnancy
5. Impaired coagulation (thrombocytopenia, warfarin therapy)
6. Previous IUD expulsion or failure
7. Anemia (hematocrit <28%)

8. History of impaired fertility in a woman desiring pregnancy

V. Postcoital Contraception

A. Hormonal Postcoital Contraception

1. Ovral, two pills (estradiol 50 mcg and norgestrel 0.5 mg) are taken within 72 hours of unprotected intercourse and repeated 12 hours later; this regimen significantly reduces the pregnancy rate and is safe.
2. Low dose pills may also be used, including Lo/Ovral, Nordette, Levlen, Triphasil, or Tri-Levlen (yellow pills only): Take four pills, then repeat four pills 12 hours later.
3. Metoclopramide (Reglan) 10 mg, with each hormone dose, is prescribed to reduce nausea and vomiting.
4. If menstruation does not begin when expected, a pregnancy test is appropriate.

B. RU486 (Mifepristone)

1. RU486 is an abortifacient, which is a competitive inhibitor of progesterone. The drug is most effective when taken early in pregnancy.
2. Dosage is 600 mg (three 200 mg tablets). The addition of misoprostol (Cytotec) 400 mg PO, 35-48 hours after RU 486, increases efficacy to 90-100%.
3. Patient management consists of a pretreatment pregnancy test, vaginal ultrasound for gestational age, hematocrit, and Rh type.
4. Confirmation that pregnancy has ended requires a repeat pregnancy test or vaginal ultrasound.

Acute Pelvic Pain

I. Clinical Evaluation

A. Assessment of acute pelvic pain should determine the patient's age, obstetrical history, menstrual history, characteristics of pain onset, duration, and palliative or aggravating factors.

B. Associated symptoms may include urinary or gastrointestinal symptoms, fever, abnormal bleeding, or vaginal discharge.

C. Past Medical History. Determine contraceptive history, surgical history, gynecologic history, history of pelvic inflammatory disease, ectopic pregnancy, sexually transmitted diseases.

D. Social History. Current sexual activity and practices should be assessed.

E. Method of Contraception

1. Sexual abstinence in the months preceding the onset of pain lessons the likelihood pregnancy-related etiologies.
2. The risk of acute PID is reduced by 50% in patients taking oral contraceptives or using a barrier method of contraception. Patients taking oral contraceptives are at decreased risk for an ectopic pregnancy or ovarian cysts because they are not ovulating.

F. Risk Factors for Acute PID. Age between 15-25 years, sexual partner with symptoms of urethritis, prior history of PID.

II. Physical Examination

A. Fever, abdominal and pelvic tenderness, or peritoneal signs should be sought.

B. Vaginal discharge, cervical erythema and discharge, cervical and uterine motion tenderness, or adnexal masses or tenderness should be noted.

III. Laboratory Tests

A. Pregnancy Testing will identify pregnancy-related causes of pelvic pain. **Quantitative Serum Radioimmunoassay** is the most sensitive pregnancy test available, becoming positive 7 days after conception. A negative test virtually excludes ectopic pregnancy.

B. Complete Blood Count. Leukocytosis suggest an inflammatory process; however, a normal white blood count occurs in 56% of patients with PID and 37% of patients with appendicitis.

C. Urinalysis. The finding of pyuria suggests urinary tract infection. Pyuria can occur with an inflamed appendix or from contamination of the urine by vaginal discharge.

D. Testing for Neisseria gonorrhoeae and Chlamydia trachomatis are necessary if PID is a possibility.

E. Pelvic Ultrasonography is of value in excluding the diagnosis of an ectopic pregnancy by demonstrating an intrauterine gestation.

1. Sonography may diagnose acute PID, torsion of the adnexa, or acute appendicitis.

F. Diagnostic Laparoscopy is indicated when acute pelvic pain has an unclear diagnosis despite comprehensive evaluation.

III. Differential Diagnosis of Acute Pelvic Pain

A. Pregnancy-Related Causes. Ectopic pregnancy, abortion (spontaneous, threatened, or incomplete), intrauterine pregnancy with corpus luteum bleeding.

B. Gynecologic Disorders. PID, endometriosis, ovarian cyst hemorrhage or rupture, adnexal torsion, Mittelschmerz, uterine leiomyoma torsion, primary dysmenorrhea, tumor.

C. Nonreproductive Tract Causes

1. Gastrointestinal. Appendicitis, inflammatory bowel disease, mesenteric adenitis, irritable bowel syndrome, diverticulitis.

2. Urinary Tract. Urinary tract infection, renal calculus.

IV. Approach to Acute Pelvic Pain with a Positive Pregnancy Test

A. In a female patient of reproductive age, presenting with acute pelvic pain, the first distinction is whether the pain is pregnancy-related or non-pregnancy-related on the basis of a serum pregnancy test.

B. In the patient with acute pelvic pain associated with pregnancy, the next step is localization of the tissue responsible for the hCG production.

C. Transvaginal ultrasound should be performed to identify intrauterine gestation. Ectopic pregnancy is characterized by a noncystic adnexal mass and fluid in the cul-de-sac.

D. If a gestational sac is not demonstrated on ultrasonography, the following possibilities exist

1. Ectopic pregnancy

2. Very early intrauterine pregnancy not seen on ultrasound

3. **Recent abortion**

E. Management of patients when a gestational sac is not seen with a positive pregnancy test

1. **Diagnostic laparoscopy** is the most accurate and rapid method of establishing or excluding the diagnosis of ectopic pregnancy.
2. **Examination of Endometrial Tissue.** For pregnant patients desiring termination, and for those patients in whom it can be demonstrated that the pregnancy is nonviable, suction curettage with immediate histologic examination of the curettings is a diagnostic option. Chorionic villi confirms the diagnosis of intrauterine pregnancy, whereas the absence of such villi indicates ectopic pregnancy.

V. Management of the Ectopic Gestation

A. Fluid Replacement. 2 IV catheters of at least 18 gauge are initiated, and 1-2 L of normal saline is infused.

B. Laparoscopy or laparotomy with linear salpingostomy or salpingectomy should be accomplished. An HCG level should be checked in one week to assure that it is declining.

VI. Acute Pelvic Pain in Non-Pregnant Patients

A. Acute PID is the leading diagnostic consideration in patients with acute pelvic pain unrelated to pregnancy. The pain is usually bilateral, but may be unilateral in 10%. Cervical motion tenderness, fever, and cervical discharge are common findings.

B. Acute appendicitis should be considered in all patients presenting with acute pelvic pain and a negative pregnancy test. Appendicitis is characterized by leukocytosis and a history of a few hours of periumbilical pain followed by migration of the pain to the right lower quadrant,. Neutrophilia occurs in 75%. A slight temperature elevation exceeding 37.3°C, nausea, vomiting, anorexia, and rebound tenderness may be present.

C. Torsion of the adnexa usually causes unilateral pain, but pain can be bilateral in 25%. Intense, progressive pain combined with a tense, tender adnexal mass is characteristic. There is often a history of repetitive, transitory pain. Pelvic sonography often confirms the diagnosis. Laparoscopic diagnosis and surgical intervention are indicated.

D. Ruptured or hemorrhagic corpus luteal cyst usually causes bilateral pain, but it can cause unilateral tenderness in 35%. Ultrasound aids in diagnosis.

E. Endometriosis usually causes chronic or recurrent pain, but it can occasionally cause acute pelvic pain. There usually is a history of dysmenorrhea and deep dyspareunia. Pelvic exam reveals fixed uterine retrodisplacement and tender uterosacral and cul-de-sac nodularity. Laparoscopy confirms the diagnosis.

VII. Diagnostic Dilemmas. Some patients with acute pelvic pain will continue to have an unclear diagnosis and management may include the following:

A. Expectant management with close clinical follow-up. Patients should be followed clinically until either the symptoms resolve or the diagnosis becomes apparent.

B. Therapeutic trial of antibiotics for presumed acute PID may be

considered with close clinical follow-up.

C. Diagnostic laparoscopy should be done if there is a risk of a surgical emergency, or if there has been a failure of a therapeutic trial of antibiotics, or if symptoms are persistent or worsening.

Chronic Pelvic Pain

Chronic pelvic pain (>6 months in duration) is less likely to be associated with a readily identifiable cause than is acute pain and pain of less than 3 months duration. Acute pain is more likely to be associated with an identifiable pathophysiologic disorder.

I. Clinical Evaluation of Chronic Pelvic Pain

A. History

1. The character, intensity, distribution, and the character and location of pain are important. Radiation of the pain or coexisting pain in other locations should be assessed.
2. The temporal patterns of the pain (onset, duration, changes, cyclicity) and aggravating or relieving factors, such as posture, meals, bowel movements, voiding, menstruation, intercourse, or medications, are documented.
3. **Associated Symptoms.** Anorexia, constipation, or fatigue are often present.
4. Previous surgeries, pelvic infections, infertility, or obstetric experiences may provide additional clues.
5. For patients of reproductive age, the timing and characteristics of their last menstrual period, the presence of non-menstrual vaginal bleeding or discharge, and the method of contraception used should be determined.
6. Life situations and events that affect the pain should be sought.
7. Gastrointestinal and urologic symptoms, including the relationship between these systems to the pain should be reviewed.
8. The patient's affect may suggest depression or other mood disorders.

B. Physical Examination

1. The patient should be asked to indicate the location of the pain. If the patient uses a single finger is used to indicate the location, it is more likely that the pain has a discrete source.
2. Abdominal deformity, erythema, edema, scars, hernias, or distension should be noted.
3. Abnormal bowel sounds may suggest a gastrointestinal process.
4. Palpation should include the epigastrium, flanks, and low back, and inguinal areas.
5. A thorough gynecologic examination is completed. The physician should focus specific attention on pain reproduction during the physical examination.
6. Postural and musculoskeletal alterations are assessed by viewing the

patient's spine while she is sitting, standing, and walking.

7. Neurologic testing of touch and reflexes is performed.

II. Laboratory Studies

A. Signs and symptoms may indicate the need for a urinalysis, cultures, serum chemistry, or complete blood count.

III. Diagnostic Studies

A. Ultrasonography may be useful when the pelvic examination is inconclusive.

B. Diagnostic laparoscopy may be helpful when the pelvic examination is abnormal or when initial therapy is unsuccessful.

IV. Gynecologic Causes of Pelvic Pain

A. Symptoms that arise from genitourinary organs range from cramps to sharp pain; the pain is felt in the lower abdomen in the midline, and it occasionally radiates to the back. Bladder or ureteral pain may radiate to the vagina or groin.

B. Endometriosis usually causes cyclical pelvic pain and dyspareunia.

C. Urinary System. Interstitial cystitis, cystitis, urethritis, and urethral syndromes all may cause chronic pelvic pain.

V. Gastrointestinal Causes of Pelvic Pain

A. Irritable bowel syndrome (IBS) is the most common GI cause of pelvic pain. It may be responsible for one half of all cases of chronic pelvic pain.

1. IBS usually causes pain that is colicky in character and associated with a sensation of rectal fullness or incomplete emptying; it is improved after a bowel movement, but is intensified by meals.
2. The symptoms of IBS often wax and wane but remain present for periods that last from weeks to months, often in association with emotional stress.
3. Constipation with intermittent diarrhea is common; however, in some cases pain is the only symptom of IBS.
4. Bulk-forming agents with ample fluids, anxiolytics, and low doses of antidepressants are used to treat IBS. Anticholinergics lack effectiveness.

B. Inflammatory Bowel Disease

1. Most patients with Crohn's disease or ulcerative colitis report poorly localized pain and diarrhea. Fever and bloody stool are common in inflammatory bowel disease but not in irritable bowel syndrome.
2. Cramping that is relieved by voluminous, often bloody diarrhea, is typical of ulcerative colitis.

C. Diverticular disease can cause abdominal pain and diarrhea in older patients. Bleeding, perforation, and abscess formation may also occur. The pain is usually located in the left lower quadrant and improves with bowel movements and the passage of flatus.

VI. Musculoskeletal Causes of Pelvic Pain

A. Herniation of an intervertebral disk, spondylolisthesis, or exaggerated lumbar lordosis may all cause pelvic pain.

B. Pain over the distribution of a peripheral nerve may be caused by herniation of a disk.

VII. Management of Chronic Pelvic Pain

A. Therapy should be directed toward resolving the underlying condition.

B. Pharmacologic Therapy

1. Processes that involve inflammation usually will respond to a nonsteroidal anti-inflammatory drug (NSAID).

2. Mild analgesics such as acetaminophen, propoxyphene, and NSAIDs may be appropriate for mild pain.

3. Stronger pain may warrant the use of narcotics. Brief use of these agents generally does not present a significant potential for abuse.

4. The use of combination medications (NSAIDs and opiates) increases analgesic potency.

5. Suppression of the menstrual cycle may be indicated in individuals with cyclic menstrual pain.

6. **Antidepressants or sleeping aids** are useful adjunctive therapies. Amitriptyline (Elavil), in low doses of 25-50 mg qhs, may be of help in improving sleep and reducing the severity of chronic pain complaints.

7. **Muscle relaxants** may prove useful in patients with guarding, splinting, or reactive muscle spasms.

C. Surgical Therapy

1. Laparoscopic uterosacral nerve ablation and presacral neurectomy have high complication rates.

2. Surgery may have a role for endometriosis and pelvic adhesions.

3. If significant pathology is not detected by laparoscopy, hysterectomy for chronic pelvic pain may be considered if the pain has persisted for more than 6 months, does not respond to analgesics, and impairs the patient's normal function.

Endometriosis

I. Pathophysiology

A. Ten percent of women will develop endometriosis characterized by the presence of endometrial tissue at sites outside the uterine cavity. The ectopic endometrial cells cause the cyclical dysmenorrhea of endometriosis.

B. The most common sites are the ovaries, posterior cul-de-sac, uterosacral ligaments, posterior broad ligament, and anterior cul-de-sac. The uterine serosa, rectovaginal septum, cervix, vagina rectosigmoid, and bladder are less frequent locations.

II. Clinical Manifestations

A. Endometriosis is characterized by cyclical pain, usually beginning prior to menses. Deep dyspareunia and sacral backache with menses are common.

B. Infertility is a frequent consequence of endometriosis. Premenstrual tenesmus or diarrhea may indicate rectosigmoid endometriosis. Cyclic dysuria or hematuria may indicate bladder endometriosis.

III. Diagnosis

A. Tender nodules are often palpable through the posterior vaginal fornix on bimanual examination and along the uterosacral ligaments on rectovaginal examination. Ovarian enlargement, fixation of the adnexal structures, and uterine retrodisplacement may also be detected.

B. Ultrasound may identify adnexal masses.

C. Endometriosis can be definitively diagnosed only by laparoscopy.

IV. Treatment of Endometriosis

A. Initial therapy consists of a nonsteroidal anti-inflammatory drug.

1. Naproxen (Naprosyn) 500 mg followed by 250 mg PO q6-8h prn [250, 375,500 mg].

2. Naproxen sodium (Aleve OTC) 200 mg PO tid.

3. Naproxen sodium (Anaprox) 550 mg, followed by 275 mg PO tid-qid prn.

4. Ibuprofen (Motrin) 800 mg, then 400 mg PO q4-6h prn.

5. Mefenamic acid (Ponstel) 500 mg PO followed by 250 mg q6h prn.

B. Combined Estrogen-Progestin. Low-dose, combination, monophasic birth control pills often relieve mild to moderate pelvic pain; they are often taken continuously.

C. Progestin-Only Regimen. Medroxyprogesterone (Provera), 10-30 mg/d, produces significant pain relief; however, frequent breakthrough bleeding limits usefulness. Depo-Provera may be used, unless fertility is desired in the near future.

D. Gonadotropin-Releasing Hormone Agonists

1. GnRH agonists inhibit gonadal function, resulting in hypoestrogenism. Pain is relieved in most patients by the second or third month.

2. Intramuscular leuprolide 3.75 mg once monthly, or nafarelin, 200 mg nasal spray twice daily for 3-6 months, may be used.

3. Side effects, such as osteoporosis, hot flashes, headaches, and depression, are common. Symptoms recur after discontinuation of therapy in most patients.

E. Conservative Surgical Therapy. Endometriosis is usually treated surgically at the time of diagnosis by laparoscopic cautery.

F. Definitive Surgery. Hysterectomy with bilateral oophorectomy is the definitive treatment for endometriosis.

Amenorrhea

Amenorrhea may be associated with infertility, endometrial hyperplasia, or osteopenia. It may be the presenting sign of an underlying metabolic, endocrine, congenital, or gynecologic disorder.

I. Pathophysiology of Amenorrhea

A. Amenorrhea may be caused by either failure of the hypothalamic-pituitary-gonadal axis, or by absence of end organs, or by obstruction of the outflow

tract.

B. Menses usually occur at intervals of 28 ±3 days, with a normal range of 18-40 days.

C. Amenorrhea is defined as the absence of menstruation for 3 or more months in a women with past menses (secondary amenorrhea) or the absence of menarche by age 16 in girls who have never menstruated (primary amenorrhea).

D. Pregnancy is the most common cause of amenorrhea.

II. Clinical Evaluation of Amenorrhea

A. History

1. Assess the menstrual history (age of menarche, last menstrual period, previous menstrual pattern). Assess diet, medications or drugs, and psychologic stress.

2. Galactorrhea, previous radiation therapy, chemotherapy, or recent weight gain or loss may provide important clues.

3. Prolonged, intense exercise can lead to amenorrhea, and it is often associated with disordered eating.

4. Previous pelvic surgery or evidence of increased androgen (acne, hirsutism, temporal balding, deepening of the voice, increased muscle mass, decreased breast size) should be sought.

5. Symptoms of decreased estrogen include hot flushes and night sweats.

Drugs Associated with Amenorrhea

Drugs that Increase Prolactin	Antipsychotics Tricyclic antidepressants Calcium channel blockers
Drugs with Estrogenic Activity	Digoxin, marijuana, oral contraceptives
Drugs with Ovarian Toxicity	Chemotherapeutic agents

B. Physical Examination

1. Breast development and pubic hair distribution should be assessed because they are indicators of exposure to estrogens and sexual maturity. Galactorrhea is a sign of hyperprolactinemia.

2. The thyroid is palpated for enlargement and nodules. Abdominal striae in a nulliparous woman may indicate hypercortisolism (Cushing's syndrome).

3. Hair distribution may reveal signs of androgen excess. The absence of both axillary and pubic hair in a phenotypically normal female suggests complete androgen insensitivity.

4. The external genitalia and vagina should be inspected for atrophy from estrogen deficiency or clitoromegaly from androgen excess. An imperforate hymen or vaginal septum can cause blockage of the out-flow tract.

5. Palpation of the uterus and ovaries assures their presence and detects gross abnormalities.

III. Diagnostic Approach to Amenorrhea

A. Patients 14 years of age or older with primary amenorrhea and lack of development of secondary sexual characteristics should be evaluated for congenital abnormalities.

B. Menstrual flow requires an intact hypothalamic-pituitary-ovarian axis, a hormonally responsive uterus, and an intact outflow tract. The evaluation strategy localizes the abnormality to either the uterus, ovary, anterior pituitary, or hypothalamus.

C. Step One--Exclude Pregnancy. Pregnancy is the most common cause of secondary amenorrhea and must be excluded with a pregnancy test.

D. Step Two--Exclude Hyperthyroidism and Hyperprolactinemia

1. Hypothyroidism and hyperprolactinemia can cause amenorrhea, and they can be excluded with a serum thyroid-stimulating hormone (TSH) and prolactin.

2. Hyperprolactinemia

a. Prolactin inhibits the secretion of gonadotropin-releasing hormone. One-third of women with no obvious cause of amenorrhea have hyperprolactinemia.

b. If the basal prolactin level is elevated, review the patient's medications, and repeat the test with the patient in a relaxed, fasting state because prolactin levels may be increased by stress, exercise, anxiety, sleep, and food ingestion.

c. Women with hyperprolactinemia should undergo MRI to rule out a pituitary tumor.

E. Step Three--Assess Estrogen Status

1. The **progesterone challenge test** is used to determine estrogen status and determine the competence of the uterine outflow tract.

2. Medroxyprogesterone (Provera) 10 mg is given orally qd for 10 consecutive days. Any uterine bleeding within 2-7 days after completion is considered a positive test. A positive result suggests chronic anovulation, rather than hypothalamic-pituitary insufficiency or ovarian failure, and a positive test confirms the presence of a competent outflow tract.

3. A negative test indicates either an incompetent outflow tract, nonreactive endometrium, or inadequate estrogen stimulation.

a. To rule out an abnormality of the outflow tract, a regimen of conjugated estrogens (Premarin), 1.25 mg daily on days 1 through 21 of the cycle, is prescribed.

(1) Medroxyprogesterone (Provera), 5 to 10 mg, is then given on the last 5 days of the 21-day cycle. (A combination oral contraceptive agent can also be used instead of the estrogen/progesterone regimen.)

(2) Withdrawal bleeding within 2-7 days of the last dose of progesterone confirms the presence of an unobstructed outflow tract and a normal endometrium, and the problem is localized to the hypothalamic-pituitary axis or ovaries.

4. In patients who have had prolonged amenorrhea, an endometrial biopsy should be considered before withdrawal bleeding is induced.

Biopsy can reveal endometrial hyperplasia or precancerous precursors, in addition to assessing ovulatory status.

F. Step Four--Evaluation of Hypoestrogenic Women

1. This step is appropriate for women with hypoestrogenic amenorrhea, as indicated by a negative progesterone withdrawal test and a competent outflow tract.

2. Serum follicle-stimulating hormone (FSH) and luteinizing hormone (LH) levels should be measured to localize the problem to the ovary, pituitary or hypothalamus.

3. Ovarian Failure

a. Ovarian failure is considered "premature" when it occurs in women less than 40 years of age.

b. A LH or FSH level greater than 50 mIU/mL indicates ovarian failure.

4. Pituitary or Hypothalamic Dysfunction

a. A normal or low gonadotropin level is indicative of pituitary or hypothalamic failure. An MRI is the most sensitive study to rule out a pituitary tumor.

b. If MRI does not reveal a tumor, a defect in pulsatile GnRH release from the hypothalamus is the probable cause.

IV. Management of Chronic Anovulation with Adequate Estrogen

A. Adequate estrogen and anovulation is indicated by withdrawal bleeding with the progesterone challenge test.

B. Often there is a history of weight loss, psychosocial stress, or excessive exercise. Women usually have a normal or low body weight and normal secondary sex characteristics.

1. Reducing stress and assuring adequate nutrition may induce ovulation.

2. These women are at increased risk for endometrial cancer because of the hyperplastic effect of unopposed estrogen.

3. Progesterone (10 mg per day for the first 7-10 days of every month) is given to induce withdrawal bleeding. If contraception is desired, a low-dose cyclic oral contraceptive may be used.

V. Management of Hypothalamic Dysfunction

A. Amenorrheic women with a normal prolactin level, a negative progesterone challenge, with low or normal gonadotropin levels, and with a normal sella turcica imaging are considered to have hypothalamic dysfunction. These women have inadequate estrogen and progesterone levels.

B. Hypothalamic amenorrhea usually results from psychologic stress, depression, severe weight loss, anorexia nervosa, or strenuous exercise.

C. Hormone Therapy for Hypoestrogenic Women

1. Hypoestrogenic women are at a greater risk for osteoporosis and cardiovascular disease.

2. Oral contraceptives are appropriate in young women.

3. Premenopausal women should take conjugated estrogen, 0.625 mg, with medroxyprogesterone (Provera) 2.5 mg, every day of the month.

4. Calcium supplementation is also recommended. Contraception should be used by sexually active women who do not desire pregnancy because pregnancy may still occur in 10%.

VI. Management of Disorders of the Outflow Tract or Uterus

A. Intrauterine Adhesions (Asherman Syndrome) are the most common outflow-tract abnormality that causes amenorrhea.

1. This disorder should be considered if amenorrhea develops following curettage or after endometritis.
2. If adhesions are present on hysterosalpingography, hysteroscopy and lysis of adhesions is performed.

VII. Management of Disorders of the Ovaries

A. Ovarian failure should be suspected if menopausal symptoms occur.

B. Women with the diagnosis of premature ovarian failure who are less than 30 years of age should undergo karyotyping to rule out the presence of a Y chromosome. If a Y chromosome is detected, testicular tissue, should be sought and removed.

C. Women between 30-40 years of age with ovarian failure can usually be assumed to have premature ovarian failure and normal chromosomes.

D. Patients with ovarian failure should be prescribed estrogen 0.625 mg with progesterone 2.5 mg daily on every day of the month with calcium.

VIII. Disorders of the Anterior Pituitary

A. Prolactin-secreting adenoma are excluded by MRI of the pituitary.

B. Bromocriptine (Parlodel) is used for most adenomas; surgery is considered later.

IX. Polycystic Ovarian Syndrome (Hyperandrogenic Chronic Anovulation) is an anovulatory state associated with androgen excess; 70% of patients have polycystic ovaries.

A. It is present in 37% of amenorrheic women, and it presents with amenorrhea, hirsutism, and obesity from puberty, but it may also present with irregular and profuse uterine bleeding. These abnormalities are caused by hyperandrogenism and hyperestrogenism.

B. Increased levels of testosterone and dehydroepiandrosterone sulfate (DHEA-S) imply PCO; however, circulating androgen levels are sometimes normal in this disorder. Increased LH or an LH/FSH ratio >2.5 can aid in diagnosis.

X. Androgen Secreting Neoplasms

A. In women with evidence of hirsutism or virilization, both total testosterone and DHEA-S levels should be determined.

B. Total testosterone levels >200 ng/mL or DHEA-S levels >7.0 ng/dL should lead to an investigation for an androgen-secreting neoplasm.

XI. Cushing's Syndrome

A. An estimate of cortisol secretion is indicated in women with amenorrhea who present with truncal obesity and striae. Sexual ambiguity may be present.

B. Basal level of 17-hydroxyprogesterone or 24-hour urinary excretion of pregnanetriol is warranted if 21-hydroxylase deficiency is suspected.

XII. Androgen Insensitivity Syndrome (Testicular feminization syndrome) is suggested by breast development in the absence of a normal amount of pubic and axillary hair, with a blind ending or absent vagina. These patients usually present during adolescence with primary amenorrhea, and they will not bleed in response to a progesterone/estrogen test. The

diagnosis is confirmed by karyotype.

Menopause

The average age of menopause is 49 years, with a range of 41-55. Menopause before age 41 is considered premature. Menopause is often diagnosed by irregular menses accompanied by hot flashes and an elevated follicle-stimulating hormone (FSH) level.

In the period before menopause, irregular menses begin to occur--shortening, then lengthening, followed by cessation of menses.

I. Climacteric Syndromes

A. Hot Flashes

1. Hot flashes are the most frequently occurring climacteric symptom, and they are characterized by sudden, episodic skin flushing and perspiration.
2. Hot flash frequency varies from less than one daily to 3 episodes per hour, with a duration of 3-4 minutes.

B. Lower Urinary Tract Atrophy

1. After menopause, atrophic changes occur in the urethra and periurethra. Loss of pelvic tone and prolapse of the urethrovesicular junction occurs.
2. Dysuria, urgency, frequency, suprapubic discomfort, stress, and urge incontinence are frequent.

C. Genital Changes

1. Shortening of the vaginal canal, loss of rugae, epithelial thinning and friability, and bacterial vaginoses are common.
2. Atrophic vaginitis, dyspareunia, or vaginal bleeding may occur.

D. Osteoporosis. Menopause is associated with decreased bone mass and increased susceptibility to fractures; estrogen supplementation decreases fracture risk by 50%.

E. Cardiovascular System. Estrogen replacement offers protection from cardiovascular disease in menopausal women.

II. Laboratory Tests

A. Menopause may be confirmed by a FSH serum level greater than 30 mIU/mL. Estradiol should be measured to assure proper timing; the level should be <75 pcg/mL.

B. Laboratory tests are sometimes indicated to exclude other diagnoses that may cause amenorrhea (thyroid disease, hyperprolactinemia, pregnancy).

C. A lipid profile, Pap smear, mammogram, and stool guaiac are indicated for routine screening.

D. Bone density measurements are not usually needed. For woman who are undecided about hormone replacement therapy, dual-energy x-ray absorptiometry can help the patient to make a more informed decision.

III. Overview of Menopause Treatment

A. Women who are still menstruating are eligible for hormone replacement

therapy (HRT) if perimenopausal and troubled by symptoms of menopause.

B. Estrogen replacement should be continued indefinitely, because stopping therapy results in rapid loss of bone. There is no upper age limit for starting estrogen replacement.

C. Breast Cancer Risk. Breast cancer risk is not significantly increased by hormone therapy in women who do not have a family history of breast cancer. However, estrogen therapy is not recommended for women with a family history of breast cancer in a first-degree relative.

D. Contraindications to Estrogen Replacement Therapy

1. Previously diagnosed or suspected breast cancer
2. Previously diagnosed or suspected endometrial cancer
3. Active liver disease
4. Active thromboembolic disease

IV. Hormone Replacement Therapy Regimens

A. Estrogen and Progestin Therapy for Patients with Uterus Present

1. Estrogen should be administered daily (continuous regimen). An interruption of therapy at the end of each month (cyclic regimen) is not necessary.

2. Progestins are added to prevent endometrial hyperplasia and to minimize the risk of uterine cancer. Progesterone is not indicated for women without a uterus.

3. Continuous Therapy

a. Conjugated estrogens (Premarin) 0.625 mg PO daily and medroxyprogesterone acetate (Provera), 2.5 mg daily continuously.

b. Combination Estrogen with Progestin (Prempro), 0.625 mg of estrogen and 2.5 mg of medroxyprogesterone in one tablet daily, continuously.

c. Some spotting and bleeding is expected initially, but amenorrhea occurs in 40% of women within 3 months.

d. In women who continue to experience spotting or bleeding 3 months after the start of continuous estrogen replacement therapy, the dosage of medroxyprogesterone may be increased to 5 mg daily. If bleeding continues after 6 months at this dosage, the dosage may be increased to 10 mg per day.

e. Follow-up endometrial biopsies are not routinely necessary. If irregular bleeding occurs after the establishment of amenorrhea, endometrial biopsy is necessary.

4. Cyclical Therapy

a. An easy cyclic schedule consists of estrogen (Premarin), 0.625 mg every day of month, with medroxyprogesterone (Provera), 5-10 mg added for first 2 weeks of each month. Some women prefer to take progesterone only every 2-3 months to reduce the frequency of menses.

b. Another cyclic regimen consists of estrogen (Premarin), 0.625 mg, on days 1 through 25, and medroxyprogesterone (Provera), 5-10 mg on days 12 through 25.

B. Hormone Replacement Side Effects

1. Gastrointestinal symptoms due to estrogen (nausea) may respond to a switch to transdermal estrogen, 0.5 mg patch, twice weekly.
2. Progestogens are associated with bloating, cramping, and irritability. Decreasing the daily progestogen dosage, or taking it on alternate days may help alleviate these symptoms.

V. Additional Menopausal Therapy

A. Calcium and Vitamin D

1. Calcium intake should be at least 1,500 mg/day, including dietary intake. Calcium supplementation is necessary for most women, especially those with poor dietary intake.
2. Vitamin D at 400 IU per day is recommended for patients with limited exposure to sunshine who do not drink Vitamin D fortified milk (especially elderly nursing home residents).

B. Exercise. Healthy woman should exercise at least 3 times a week for 30 minutes.

C. Atrophic Vaginitis

1. Local application of estrogen (0.6 mg of conjugated estrogen cream--about 1/4 of an applicator) daily for 1-2 weeks, then 2-3 times/week will usually relieve urogenital symptoms.
2. This regimen is used concomitantly with oral estrogen.

Premenstrual Syndrome

Premenstrual Syndrome (PMS) is a cyclic disorder characterized by behavioral, emotional, and physical symptoms during the luteal phase of the menstrual cycle (the 5-11 days before menses). Emotional manifestations include irritability, depression, hostility, and social withdrawal. Physical complaints include bloating, breast tenderness, myalgia, headache, and fatigue.

I. Clinical Evaluation of Premenstrual Syndrome

A. PMS only occurs during ovulatory cycles. Ovulatory cycles are characterized by a regular intermenstrual interval with a consistent menstrual flow.

B. Emotional/Behavioral Symptoms. Anxiety, altered libido, anger, depression, food cravings, insomnia, irritability, panic attacks, poor concentration, reduced coping skills, tearfulness.

C. Physical Symptoms. Abdominal bloating, breast swelling or tenderness, constipation, dizziness, fatigue, fluid retention, headaches, hot flashes, and muscle aches and pains.

D. Physical Examination. Coexisting medical disorders or evidence of hypertension, hirsutism, or striae should be identified.

E. Laboratory Evaluation

1. No specific laboratory test for PMS exist.
2. **Testing to Identify Clinically Suspected Disorders**
   - **a.** Gonococcal and chlamydia culture, HIV antibody (if risk factors).
   - **b.** Serum prolactin level (if galactorrhea or irregular menstrual cycles

or atypical mastalgia).

c. Measure FSH and LH levels if over 40 years of age, or if hot flashes or irregular menses.

d. Thyroid-stimulating hormone and complete blood count are checked if menorrhagia or chronic fatigue are present.

II. Treatment of Premenstrual Syndrome

A. Diet and Exercise

1. Encourage well-balanced meals that are low in sodium and fat, and high in fiber. Simple carbohydrates and caffeine are limited.

2. Exercise and relaxation therapy with deep breathing and mental imagery will often bring improvement.

B. If the patient is taking oral contraceptives, they should be discontinued during the initial phases of treatment.

C. Fluid Retention Symptoms

1. Bloating, weight gain, and swelling may respond to reduced dietary salt.

2. Diuretics may be prescribed for women with premenstrual weight gain. Start diuretic just before the onset of water retention and weight gain, and continue until the onset of menstruation.

3. Furosemide (Lasix) 20-40 mg qAM, or any other diuretic may be used. If hypokalemia is a concern, a potassium-sparing agent, such as spironolactone 25-50 mg bid is used.

D. Premenstrual Headache and Cramps

1. NSAIDs are effective for pain, particularly premenstrual migraine. Start 1 or 2 days before anticipated onset of symptoms and continue throughout menstruation.

2. Mefenamic acid (Ponstel) 250-500 mg tid.

3. Naproxen (Naprosyn) 250-500 mg PO bid.

4. Naproxen sodium (Aleve, Anaprox) 550 mg bid.

E. Mastalgia

1. A support bra, reduced caffeine intake, NSAIDs and/or oral contraceptives are often helpful.

2. Bromocriptine (Parlodel), 5 mg per day, on days 10-26 of the menstrual cycle is effective.

F. Emotional Symptoms. Fluoxetine (Prozac), 20 mg/d is effective.

G. Anxiety and Agitation

1. Alprazolam (Xanax) significantly reduces mood swings, irritability, and anxiety; 0.125-0.25 mg tid; begin several days before symptoms are due to appear and taper the dosage at the onset of menses.

2. Buspirone (BuSpar) is a nonsedating, non-benzodiazepine anxiolytic; 10 mg tid. It does not promote physical dependence, and it is useful when given cyclically in the luteal phase or continuously.

H. Ovulation Suppression

1. Oral contraceptives decrease dysmenorrhea, moliminal symptoms, and emotional changes. A monophasic pill with a relatively high progestin content is recommended.

2. Danazol may be effective in PMS, but its role remains limited because of androgenic and hypoestrogenic side effects.

3. **Gonadotropin-releasing Hormone (Gn-RH) Agonists**
   a. Gn-RH agonists improve symptoms in patients who fail to respond to other therapies. Gn-RH agonists inhibit gonadotropin release and induces a pseudomenopause; available in nasal spray.
   b. Osteoporosis and coronary artery disease are adverse effects; the duration of therapy is limited to 3 to 6 months.
4. **Estrogen**
   a. Oral estrogen or transdermal estradiol may be used to treat vasomotor flushes.
   b. Medroxyprogesterone prevents development of endometrial hyperplasia.

Sexual Assault

Sexual assault is defined as any sexual act performed by one person on another without that person's consent. This may occur as a result of threat of force or as a result of the victim's inability to give consent. If the victim is a minor, the physician is required by law to report the incident to authorities.

I. Medical Evaluation

A. After acute injuries have been stabilized, a careful history and physical examination should be performed. A chaperon should be present to reassure the victim.

B. The date of last menstrual period, birth control regimen, and history of previous infections should be noted. Determine whether the patient may have a preexisting pregnancy, be at risk for pregnancy, or have a preexisting infection.

C. Documentation should include a history of when the patient last had consensual intercourse before the attack.

D. An accurate account of the attack should be recorded, including the specific act(s) involved.

E. Physical Examination

1. Informed consent must be obtained before the examination is begun.
2. The patient's entire body should be examined, and each injury should be described in detail. Photographs or drawings are made of injured areas.
3. If oral penetration has occurred, injuries of the mouth and pharynx may be present. A culture for gonorrhea should be completed.
4. Saliva is collected from the victim to ascertain whether she is a secretor of a major blood group antigen in order to differentiate her secretions from those of the attacker.
5. Fingernail scrapings should be obtained and evaluated for skin or blood of the attacker if the victim scratched him.
6. Lacerations of the hymen and vagina or injury to the urethra should be noted. Lesions around the vulva or rectum may be present.
7. Pelvic examination should assess the status of the reproductive

organs and samples are collected from the cervix and vagina. Samples also include pubic hair combings and a sample of the patient's hair.

a. Vaginal secretions should be observed by wet prep for motile sperm or trichomonas, and samples should be collected for acid phosphatase from seminal fluid and DNA fingerprinting.

b. Smears of vaginal secretions or a Pap smear should be made to document the presence of sperm.

c. Appropriate sites are cultured for gonorrhea and chlamydia.

8. Skin washings and clothing should be investigated for acid phosphatase and submitted to legal authorities.

9. Baseline serology for syphilis, herpes simplex virus, hepatitis B virus, and HIV are obtained.

II. Postcoital Contraception

A. If the patient is at risk for pregnancy and pregnancy testing is negative, postcoital contraception consists of two Ovral contraceptive tablets at the time the victim is seen and two tablets in 12 hours.

B. An alternative regimen consists of four low dose oral contraceptive tablets (LoOvral) now, and repeated in 12 hours.

C. A pregnancy test should be performed at the time of the return visit if menses has not occurred.

D. Metoclopramide (Reglan), 20 mg with each dose of hormone, is prescribed for nausea.

III. Sexually Transmitted Disease Prophylaxis

A. Chlamydia trachomatis is the STD that is most likely to be acquired. The risk for adult rape victims of acquiring gonorrhea is 6-12%; that of acquiring syphilis is up to 3%.

B. Gonorrhea, chlamydia, Gardnerella, and syphilis coverage is necessary.

C. Ceftriaxone (Rocephin) 250 mg IM, and doxycycline 100 mg PO bid x 7d, and metronidazole 2 gm orally in a single dose.

D. Azithromycin (Zithromax) is used if the patient is unlikely to comply with the 7 day course of doxycycline; single dose of four 250 mg caps.

E. If the patient is penicillin-allergic, ciprofloxacin 500 mg PO or ofloxacin 400 mg PO is substituted for ceftriaxone.

F. If the patient is known to be pregnant, erythromycin 500 mg PO qid for 7 days is substituted for doxycycline.

G. HIV prophylaxis consists of zidovudine (AZT) 200 mg PO tid, plus lamivudine (3TC) 150 mg PO bid for 4 weeks.

H. Hepatitis B immune globulin should be considered.

IV. Emotional Care

A. The physician should discuss the injuries and the probability of infection or pregnancy with the victim, and she should be allowed to express her anxieties.

B. Anxiolytic medication may be useful; lorazepam (Ativan) 1-5 mg PO tid prn anxiety.

C. The patient should be referred to personnel trained to handle rape-trauma victims within 1 week.

V. Follow-up Care

A. The patient is seen for medical follow-up in 2-4 weeks for documentation of healing of injuries.

B. Repeat testing includes syphilis, hepatitis B, and gonorrhea and chlamydia cultures. HIV serology should be repeated in 3-6 months.

C. A pregnancy test should be performed if conception is suspected

Abnormal Uterine Bleeding

Although menorrhagia is occasionally caused by potentially treatable diseases, such as thyroid dysfunction, infections or cancer, the excessive bleeding is most often related to anovulatory menstrual cycles. Menorrhagia caused by anovulation is referred to as dysfunctional uterine bleeding.

I. Pathophysiology of Normal Menstruation

A. In response to gonadotropin-releasing hormone from the hypothalamus, the pituitary gland synthesizes follicle-stimulating hormone (FSH) and luteinizing hormone (LH) which induce the ovaries to produce estrogen and progesterone.

B. During the follicular phase, estrogen stimulation causes an increase in endometrial thickness. After ovulation, progesterone causes endometrial maturation and secretory changes.

C. **Abnormal Bleeding** is characterized by bleeding that occurs at intervals of less than 21 days, more than 36 days, lasting longer than 7 days, or blood loss greater than 80 mL.

II. Clinical Evaluation of Abnormal Uterine Bleeding

A. Obtain a menstrual and reproductive history, including last menstrual period, regularity, duration, and frequency; ascertain the number of pads used per day, and ask about intermenstrual bleeding.

B. Assess the presence of stress, exercise, weight changes, and systemic diseases, particularly thyroid, renal or hepatic diseases, or coagulopathies.

C. The method of birth control should be determined.

D. Pregnancy complications, such as spontaneous abortion, ectopic pregnancy, placenta previa and abruptio placentae, can all cause non-cyclical, heavy bleeding. Pregnancy should always be considered as a possible cause of abnormal uterine bleeding.

E. Determine whether the patient is having ovulatory or anovulatory cycles

1. Ovulatory cycles are characterized by menstrual flows occurring at regular intervals, preceded by premenstrual symptoms (breast tenderness or fullness, pelvic cramping, and edema).

2. If cycles are anovulatory, the patient has dysfunctional uterine bleeding.

F. The clinical approach to abnormal uterine bleeding involves dividing patients into three age groups:

1. **Puberty and Adolescence.** Menarche to age 16
2. **Primary Childbearing Years.** Ages 16 to early 40's
3. **Premenopausal, Perimenopausal, and Postmenopausal Years.** Early 40's and older

III. Puberty and Adolescence

A. Irregularity is normal during the first few months of menstruation; however, soaking more than 25 pads or 30 tampons during a menstrual period is abnormal.

B. Absence of premenstrual symptoms (breast tenderness, bloating, cramping) is associated with anovulatory cycles.

C. Fever, particularly in association with pelvic or abdominal pain or dyspareunia, may indicate pelvic inflammatory disease.

D. A history of easy bruising suggest a coagulation defect. Headaches and visual changes suggest a CNS cause, such as a pituitary tumor.

E. Physical Findings

1. Pallor not associated with tachycardia or signs of hypovolemia suggests chronic excessive blood loss, such as that occurring with anovulatory bleeding, adenomyosis, uterine myomas, or blood dyscrasia.
2. Signs of impending shock indicate that the blood loss is likely related to pregnancy (including ectopic), trauma, sepsis, or neoplasia.
3. Pelvic masses may represent pregnancy, uterine or ovarian neoplasia, or a pelvic abscess or hematoma.
4. Fever, leukocytosis, and pelvic tenderness suggests PID.
5. Fine, thinning hair, and hypoactive reflexes suggest hypothyroidism.
6. Ecchymoses or multiple bruises may indicate trauma, coagulation defects, medication use, or dietary extremes.

F. Laboratory Tests

1. CBC and platelet count, urinalysis, Pap smear, and a urine or serum pregnancy test are completed.
2. Screening for sexually transmitted diseases, thyroid function, and coagulation disorders (partial thromboplastin time, prothrombin time, and bleeding time) is necessary.
3. **Endometrial sampling** is rarely necessary for those under age 20.

G. Treatment of Infrequent Bleeding

1. Therapy should be directed at the underlying cause when possible.
2. If the CBC and results of other initial laboratory tests are normal, and the history and physical examination are normal, reassurance is usually all that is necessary.
3. Ferrous sulfate, 325 mg bid-tid.

H. Treatment for Frequent or Heavy Bleeding

1. Nonsteroidal anti-inflammatory drugs (NSAIDs) inhibit prostaglandins in the endometrium, improve platelet aggregation, and increase uterine vasoconstriction.
2. NSAIDs are the first choice in the treatment of menorrhagia, because they are well tolerated, associated with a low incidence of side effects,

and they do not have the hormonal effects of oral contraceptives. Additionally, women with menorrhagia frequently also have dysmenorrhea, and NSAIDs are effective for this problem.

3. **Specific Agents**
   - **a.** Mefenamic acid (Ponstel), 500 mg tid daily for 3 days during the menstrual period.
   - **b.** Naproxen (Anaprox, Naprosyn), a 500-mg loading dose, then 250 mg three times daily for 5 days.
   - **c.** Ibuprofen (Motrin, Nuprin), 400-600 mg tid during the menstrual period.
   - **d.** These agents are equally effective.
   - **e.** Gastrointestinal distress is common, and these agents are contraindicated in renal failure and peptic ulcer disease.
4. Iron therapy should be added; 325 mg qd-tid.

I. Patients with hypovolemia or a hemoglobin level below 7 g/dL should be hospitalized for hormonal therapy, iron replacement, and possibly transfusion.

1. Hormonal therapy consists of estrogen (Premarin) 25 mg IV q6h until bleeding stops. Begin oral contraceptive pills q6h x 7 days, then taper slowly.
2. If bleeding continues, IV vasopressin (DDAVP) is used. Hysteroscopy may be necessary. Dilation and curettage is a last resort.

IV. Primary Childbearing Years

A. Contraceptive complications and pregnancy are the most common causes of abnormal bleeding in this age group. Anovulatory conditions account for 20% of cases.

B. Adenomyosis, endometriosis, and fibroids increase in frequency as a woman ages, as do endometrial hyperplasia and endometrial polyps. PID, endocrine dysfunction, and all other causes may sometimes occur.

C. Laboratory Tests

1. CBC and platelet count, urinalysis, Pap smear, and a pregnancy test.
2. Screening for sexually transmitted diseases, thyroid dysfunction, and coagulation disorders (partial thromboplastin time, INR, bleeding time) is completed.
3. If a non-pregnant woman has a pelvic mass, evaluation is required with ultrasonography or hysterosonography (with uterine saline infusion), and, if necessary, CT, or laparoscopy.

D. Endometrial Sampling

1. Long-term unopposed estrogen stimulation in anovulatory patients can result in endometrial hyperplasia, which can progress to adenocarcinoma; therefore, in perimenopausal patients who have been anovulatory for an extended interval, the endometrium should be biopsied.
2. Biopsy is also carried out before initiation of hormonal therapy for women over age 30 and for those over age 20 who have prolonged bleeding. Risk factors for endometrial hyperplasia include anovulation, obesity, and infertility or decreased parity.
3. Endometrial biopsy with Pipelle should be done on the first day of

menstruation, to avoid an unexpected pregnancy, or anytime if bleeding is continuous. If hysteroscopy is done first, it will reveal up to 30% of abnormalities that would be missed by endometrial sampling. Hysterosonography with uterine saline infusion may also be used.

E. Patients with pelvic masses usually require an ultrasound.

F. Treatment

1. Medical protocols for anovulatory bleeding (dysfunctional uterine bleeding) are similar to those above.

2. Hormonal Therapy

a. In women who do not desire immediate fertility, hormonal therapy may be used to treat menorrhagia.

b. A 21-day package of oral contraceptives, containing 35 mcg of estrogen (Ortho-Novum 1/30), is used. Have the patient take one pill three times a day for 7 days. During the 7 days of therapy, bleeding should subside and, following treatment, heavy flow will occur. After 7 days off the hormones, another 21-day package is initiated, taking one pill a day for 21 days, then no pills for 7 days.

c. Alternatively, a cyclic regimen of medroxyprogesterone (Provera), 10-20 mg per day for days 16 through 25 of each month also results in a reduction of menstrual blood loss. Pregnancy will not be prevented.

3. Iron therapy should be added; 325 mg qd-tid.

4. Surgical treatment can be considered if childbearing is completed and medical management fails to provide relief.

V. Patients Age 40 and Over

A. Anovulatory bleeding accounts for about 90% of abnormal uterine bleeding in this age group. However, bleeding should be considered to be from cancer until proven otherwise.

B. History, physical examination, and laboratory testing are indicated as described above.

C. Menopausal symptoms, personal or family history of malignancy, and use of estrogen should be sought.

D. If a woman has a pelvic mass, an evaluation with ultrasonography, CT, and/or MRI is necessary.

E. Endometrial Carcinoma

1. In a perimenopausal or postmenopausal woman, amenorrhea preceding abnormal bleeding suggests a malignancy of the endometrium.

2. Endometrial evaluation is necessary before treatment for abnormal uterine bleeding.

3. Before endometrial sampling, determination of endometrial thickness by transvaginal ultrasonography is useful because biopsy is often not required when the endometrium is less than 5 mm thick. An endometrium thicker than 5-6 mm in a postmenopausal patient requires biopsy.

F. Treatment

1. Cystic hyperplasia or endometrial hyperplasia without cytologic atypia is treated with depo-medroxyprogesterone. Start with 200 mg IM, then

give 100 to 200 mg IM every 3 to 4 weeks for 6 to 12 months. Endometrial hyperplasia requires repeat endometrial biopsy every 3 to 6 months.

2. Atypical hyperplasia requires fractional dilation and curettage, followed by progestin therapy or hysterectomy.
3. If the patient's endometrium is normal (or atrophic) and contraception is a concern, lower-dose oral contraceptive products may be used. If contraception is not needed, estrogen replacement therapy should be prescribed.
4. **Surgical Management**
   a. **Vaginal or Abdominal Hysterectomy** is the most absolute curative treatment.
   b. **Dilatation and Curettage** is used only as a temporizing measure.
   c. **Endometrial Ablation and Resection** by laser, electrodiathermy "rollerball," or excisional resection are alternatives to hysterectomy.

Evaluation of Breast Masses

I. Recommended Intervals for Breast Cancer Screening Studies

	Age <40 yr	40-49 yr	50-75 yr
Breast Self-Examination	Monthly by age 30	Monthly	Monthly
Professional Breast Examination	Every 3 yr, ages 20-39	Annually	Annually
Mammography			
High-risk Patient	Baseline at 35-39 yr	Annually	Annually
Low-risk Patient		Baseline at 40, then optional	Annually

II. Differential Diagnosis of Breast Masses

A. <30 Years Old. The common causes are fibroadenoma, papillomatosis, abscess (especially if lactating), and fat necrosis.

B. 30-50 Years Old. Common causes include fibrocystic mastopathy, cancer, fatty lobule, or cystosarcoma phylloides.

C. Older than 50. Cancer is the primary diagnosis, followed by fibrocystic mastopathy, fat necrosis, and cyst.

III. Clinical Evaluation of Breast Masses

A. The history should assess how long the mass has been present, associated pain (especially if cyclical), any change in size, and the color of any nipple discharge.

B. Determine results of, and time since, the last clinical breast examination

and the last mammogram.

C. Risk Factors. A risk assessment is undertaken for breast cancer risk factors, including patient age over 50 years, past personal history of breast cancer, history of hyperplasia on previous breast biopsies, and family history of breast cancer in a first-degree relatives (mother, sister, daughter). 80% of women with breast cancer have no risk factors other than being women and over 50 years old.

D. Physical Examination

1. The patient then should sit up with arms first at her side and then behind her head, this facilitates examination of the breast contours and allows visualization of nipple inversion or tethering.
2. Examine for dimpling, asymmetry, lumps, thickened areas, or shape or contour. Compress nipples to identify any discharge and palpate both axillae. Assess masses for multiple components, mobility, and cystic or solid qualities. A drawing should be made of any irregularities or masses.
3. The patient is examined in the supine position with her arms up and behind her head, this flattens the breast tissue and compresses it for examination.
4. Very discrete, smooth nodules are more likely to be benign; tenderness is associated with benignity.

IV. Triple Test Diagnosis of Breast Masses

A. In the triple test, a palpable breast nodule is assessed by physical exam, mammography, and aspiration biopsy.

B. Each test taken individually has a significant false negative rate. However, taken together, the tests have a false negative rate equal to a surgical biopsy. The false negative rate for the triple test is 0.4%, compared with the 0.5-1% rate for surgical diagnosis.

C. If the clinical exam, mammography, and fine-needle aspiration biopsy are benign, open biopsy is usually not necessary. A benign breast nodule by triple test can be managed by conservative follow-up, with breast self examination and professional examinations over 2-3 years.

D. Any mass that is either clinically or mammographically suspicious for cancer generally requires excisional biopsy, even if the fine needle aspiration biopsy is benign.

E. Mammography is usually not clinically appropriate for patients under 35 years old. For this group, the double test of physical examination and cytologic examination is sufficient.

F. An ultrasound of the breast may sometimes be obtained to determine if the mass is cystic or solid. If the lesion is cystic, no further management is necessary, or the fluid can be removed and the cyst collapsed by needle aspiration. If the mass is solid, fine needle aspiration biopsy is recommended.

G. Fine-Needle Aspiration Biopsy (FNAB)

1. The skin is prepped with alcohol and the lesion is immobilized by the nonoperating hand. A 10 mL syringe with a 18 to 22 gauge needle is introduced in to the central portion of the mass at a 90° angle. When the needle enters the mass, suction is applied by retracting the

plunger, and the needle is advanced. The needle is directed into different areas of the mass while maintaining suction on the syringe.

2. Suction is slowly released before the needle is withdrawn from the mass. The contents of the needle is placed onto glass slides for pathologic examination.

H. Cyst Aspiration. If the physical characteristics (or ultrasound) support the diagnosis of a cyst, needle aspiration may be done.

1. Using the same technique as for FNAB, the cyst fluid is evacuated.
2. Successful aspiration of a simple cyst will yield nonbloody fluid followed by complete resolution of the mass. Watery fluid may be discarded. However, cyst fluid that is bloody or unusually tenacious, should be examined cytologically.
3. If the lesion is found to be solid or if no fluid is obtained, the needle is used to aspirate tissue as in a FNAB.
4. A residual mass after aspiration or presence of a bloody aspirate requires open biopsy. Before the referral, a mammogram should be obtained for any patient over age 35 who has not had a mammogram within the preceding 6 months.

V. Evaluation of Breast Lesions Detected by Screening Mammography

A. For any lesions identified as demonstrating micro-calcifications that suggest cancer, referral for open biopsy is recommended.

B. Any lesions identified as having architectural distortion or interval growth when compared with a previous mammogram, should be referred for open biopsy.

Breast Disorders

I. Nipple Discharge

A. Clinical Evaluation

1. Nipple discharge may be a sign of cancer, and it must be evaluated. Eight percent of biopsies performed for nipple discharge demonstrate cancer.
2. Determine the duration, bilaterality or unilaterality of the discharge, and the presence of blood. A history of oral contraceptives, hormone preparations, phenothiazines, nipple or breast stimulation, or lactation should be determined. Discharges that flow spontaneously are more likely to be pathologic than discharges that must be manually expressed.
3. Unilateral, pink colored, bloody or non-milky discharge, or discharges associated with a mass are the discharges of most concern.
4. Bilateral, milky discharge suggest an endocrine problem. Nipple discharge secondary to malignancy is more likely to occur in older patients.
5. **Risk Factors.** A risk assessment should identify risk factors, including age over 50 years, past personal history of breast cancer, history of hyperplasia on previous breast biopsies, and family history of breast

cancer in a first-degree relative (mother, sister, daughter).

B. Physical examination should include inspection of the breast for ulceration or contour changes and inspection of the nipple. Palpation should be performed with the patient in both the upright and the supine position to determine the presence of a mass.

C. Diagnostic Evaluation

1. If the discharge appears bloody, the patient should be referred to a surgeon for evaluation. At the time of referral, a mammogram of the involved breast should be obtained if the patient is over 35 years old and has not had a mammogram within the preceding 6 months.

2. Patients with a watery, unilateral discharge should be referred to a surgeon for evaluation and possible biopsy.

3. Non-bloody discharge should be tested for the presence of blood with standard Hemoccult cards. Nipple discharge secondary to carcinoma usually contains hemoglobin.

4. If the discharge appears milky or is bilateral, prolactin and thyroid stimulating hormone assays should be completed to exclude an endocrinologic cause.

a. A mammogram should also be performed if the patient is due for routine mammographic screening.

b. If results of the mammogram and the endocrinologic screening studies are normal, the patient should return for a follow-up visit in 6 months to ensure that there has been no specific change in the character of the discharge, such as development of bleeding.

II. Breast Pain

A. Determine the duration and location of the pain, associated trauma, previous breast surgery, associated lumps, or nipple discharge.

B. Pain is an uncommon presenting symptom for breast cancer; however, cancer must be excluded. Cancer is the etiology in less than 5% of patients with breast pain. Pain that is associated with breast cancer is usually unilateral, intense, and constant.

C. Patients Less Than 35 Years of Age Without a Mass

1. It is unlikely that the pain is a symptom of cancer.

2. A follow-up clinical breast examination is performed in 1-2 months. Diagnostic mammography is usually not helpful but may be considered.

D. Patient 35 Years of Age or Older

1. Obtain diagnostic mammogram, and obtain an ultrasound if the lesion is cystic.

2. If studies are negative, a follow-up examination in 1-2 months is appropriate.

3. If a suspicious lesion is detected, biopsy is required.

E. Mastodynia

1. Mastodynia is defined as breast pain in the absence of a mass or other pathologic abnormality.

2. Causes of mastodynia include menstrually related pain, costochondritis, trauma, and sclerosing adenosis.

III. Fibrocystic Complex

- **A.** Breast changes are usually multifocal, bilateral, and diffuse. One or more isolated fibrocystic lumps or areas of asymmetry may be present. The areas are usually tender.
- **B.** This disorder predominantly occurs in women with premenstrual abnormalities, nulliparous women, and nonusers of oral contraceptives.
- **C.** The disorder usually begins in mid-20's or early 30's. Tenderness is associated with menses and lasts about a week. The upper outer quadrant of the breast is most frequently involved bilaterally.
- **D.** There is no increased risk of cancer for the majority of patients.
- **E.** Suspicious areas may be evaluated by fine needle aspiration (FNA) cytology. If mammography and FNA are negative for cancer, and the clinical examination is benign, open biopsy is generally not needed.
- **F. Medical Management of Fibrocystic Complex**
  1. **Oral Contraceptives** are effective for severe breast pain in most young women. Start with a pill that contains low amounts of estrogen and relatively high amounts of progesterone (LoEstrin, LoOvral, Ortho-Cept).
  2. If oral contraceptives do not provide relief, medroxyprogesterone 5-10 mg per day from days 15-25 of each cycle is added.
  3. A professionally fitted support bra often provides significant relief.
  4. **Dietary Changes.** A low fat, caffeine-free diet, vitamins (E and B complex), evening primrose oil, and stopping smoking may provide relief.
  5. NSAIDs and bromocriptine have been used.

Osteoporosis

Osteoporosis is characterized by reduced bone mass leading to an increased risk of fracture. The best way to manage osteoporosis is through prevention.

I. Pathophysiology

- **A.** After menopause, women experience bone loss of 3-4% per year. If bone loss is not stopped, 90% of women will have osteoporosis by age 80.
- **B.** After age 50, the risk of hip fracture doubles every 5 to 10 years.
- **C.** The incidence of osteoporosis is higher in women than in men because of lower peak bone mass and a more rapid loss of bone.

II. Risk Factors for Osteoporosis

- **A.** White and Asian women have a higher risk than black women. Slender build and low body weight also increase risk.
- **B.** Prolonged estrogen deficiency and amenorrhea can lead to bone loss in young women.
- **C.** A diet low in calcium, sedentary lifestyle, cigarette smoking, and excessive alcohol use increase the risk of osteoporosis.
- **D.** Women who have suffered a fracture of any type have twice the average risk of having another fracture.

E. Medications That Predispose to Osteoporosis. Phenytoin (Dilantin), excessive thyroid hormone, systemic corticosteroids, long-term use of inhaled corticosteroids, prolonged use of depo-medroxyprogesterone (Depo-Provera)

III. Diagnosis of Osteoporosis

A. Osteoporosis may be apparent when radiographs are taken for an unrelated reason.

B. History should include age at onset of menopause (natural or surgical), calcium intake, level of physical activity, family history of osteoporosis, presence of other medical conditions, medications, and back pain.

C. Physical Examination. Spinal deformity, tenderness, and immobility are assessed.

D. Laboratory Testing to exclude secondary causes of osteoporosis may include a biochemical profile, complete blood count, thyroid function tests, serum and urine protein immunoelectrophoresis, testosterone level (in men), and 24-hour urinary calcium, cortisol, and creatinine excretion.

E. Bone Mineral Density Testing

1. Dual-energy x-ray absorptiometry (DEXA) is the best choice for measurement of bone mineral density because it is the most precise and requires the lowest dose of radiation.

2. Bone mineral density testing is indicated for patients who refuse hormone replacement therapy, because results can substantially influence a woman's decision.

3. Periodic testing is not routinely indicated during treatment unless it improves adherence.

IV. Treatment of Established Osteoporosis

A. Calcium carbonate (Tums), one 500 mg tab, 2 times a day, and vitamin D 400 units daily should be prescribed. Intake of 1500 mg/day of calcium is recommended.

B. Hormone Replacement Therapy

1. Estrogen is the treatment of choice for both prevention and treatment of osteoporosis. Therapy can result in a 5-15% increase in bone mineral density after 3 years.

2. No significant increased risk of breast cancer has been found; however, women with a family history of breast cancer in a first-degree relative should probably not be given estrogen.

3. Estrogen has a cardiovascular protective effect, which may decrease the occurrence of ischemic heart disease by 50%.

4. Estrogen Regimens

a. Conjugated estrogen (Premarin) 0.625 mg daily and medroxyprogesterone (Provera) 2.5 mg daily.

b. Combination estrogen and progesterone (Prempro), 0.625 mg of estrogen and 2.5 mg of medroxyprogesterone in one tablet, taken daily.

5. Estrogen Contraindications. History of uterine or breast cancer, history of thromboembolism, abnormal liver function.

C. Bisphosphonates--Alendronate (Fosamax)

1. Alendronate reduces the risk of hip and spine fractures by decreasing

the rate of bone resorption, increasing bone density 3% per year.

2. Alendronate is indicated for women with osteoporosis who can not take estrogen. Since it is not a hormone, alendronate may be suitable for men and for women with a personal or family history of breast cancer. Alendronate does not have the cardiovascular protective effects of estrogen.
3. **Dosage.** 10 mg a day before breakfast. Alendronate is poorly absorbed; therefore, it must be taken 1 hour before drinking coffee or juice, and before eating any food, or taking any other medication. The patient must remain upright for 30 minutes to prevent esophagitis.
4. The incidence of side effects is acceptable, with GI upset being the most common.

D. Calcitonin

1. Calcitonin (Miacalcin) is an alternative for women who are unable to use estrogen or alendronate. Calcitonin has weaker effects on bone than estrogen.
2. Calcitonin has an analgesic effect, which may make it useful for women with chronic back pain. Calcitonin does not offer the additional protective effects of estrogen, such as cessation of menopausal symptoms or cardiovascular protection.
3. Dosage is 200 IU (one spray) per day in alternating nostrils.

V. Prevention of Osteoporosis

A. Calcium Intake

1. 1,500 mg per day of calcium is recommended for postmenopausal women.
2. If a patient's diet does not provide adequate calcium, supplementation should be recommended. Calcium carbonate (Tums) provides the most elemental calcium per gram. It is best absorbed if taken with meals as one 500 mg tab, 2 times a day.
3. Calcium supplementation is contraindicated in patients with a history of nephrolithiasis, sarcoidosis, hyperparathyroidism, and certain malignancies causing hypercalcemia.

B. Vitamin D

1. Vitamin D is required for calcium absorption and is synthesized after exposure to sunlight.
2. The recommended daily allowance is 400 U; most multivitamins contain this amount. Milk contains 100 U of vitamin D per cup.
3. Vitamin D is recommended for housebound elderly patients and those living in nursing homes. Persons who live in the northern states may also benefit from supplements during the winter months.

C. Exercise: Weight-bearing exercise helps maintain bone mass and should be recommended to all patients able to comply.

D. Estrogen therapy stops or slows bone loss, even after age 80. Use reduces vertebral fractures by about 50-80%.

Infertility

Infertility affects 10-15% of couples. The prevalence of infertility is 33% in those aged 35-39, and 50% after age 40. With evaluation and treatment, at least 50% of infertile couples will become pregnant.

Infertility is defined as the failure of a couple to conceive after one year of frequent Intercourse. Male factors account for 35%, tubal or pelvic pathology accounts for 35%, ovulatory dysfunction for 15%, cervical or anatomic causes 5%, and 10% of cases remain unexplained.

I. Clinical Evaluation of Infertility

A. Fertility History. Determine the couple's ages, previous pregnancies, length of time attempting conception, occupations, and use of tobacco, alcohol, or drugs. Determine frequency and technique of intercourse, use of lubricants (which can be spermicidal), and presence of dyspareunia.

B. Initial History for the Male Partner includes a sexual development history, history of prior paternity, exercise habits, frequency and volume of ejaculation, exposure to radiation or gonadal toxins, STD history, urologic surgery, medications, and history of mumps.

C. Initial History for the Female Partner includes history of pelvic inflammatory disease, galactorrhea, pelvic pain, gynecologic surgery, IUD use, DES exposure, and hirsutism.

1. Menstrual cycle length and regularity and indirect indicators of ovulation such as Mittelschmerz, mid-cycle cervical mucus change and premenstrual molimina should be assessed.
2. Symptoms of hyperthyroidism, hypothyroidism, hot flashes, weight loss, dieting, and severe stress should be sought.
3. Use of tobacco, alcohol and caffeine should be assessed, but only very high doses (>700 mg/day) of caffeine are associated with infertility.

II. Evaluation of the Male Partner

A. Body habitus, hair distribution, and testicular size (normal is 3 x 5 cm) are assessed.

B. Varicoceles, prostate enlargement, or prostate tenderness are sought.

C. Hypertension, diabetes, vascular disease or endocrine disorders are excluded.

D. Semen Analysis

1. Semen analysis is the initial step in the infertility evaluation because this test is simple and inexpensive, and it may result in a diagnosis in 35% of couples.
2. The sample should be collected after 2 days of abstinence and evaluated within 1 hour, keeping the sample close to body temperature. If any parameters are abnormal, two additional semen analyses should be performed 2 weeks apart.

Semen Analysis Interpretation

Semen Parameter	Normal Values	Poor Prognosis
Sperm concentration	>20 million/mL	<5 million/ mL
Sperm motility	>5% progressive motility	<10% motility
Sperm morphology	>60% normal	<4% normal
Ejaculate volume	2-5 cc	<2 cc
White blood cells	<5/high power field	many
Agglutination	none	present
Clumping	none	present

III. Evaluation of the Female Partner

A. Physical examination should exclude thyroid dysfunction, hypertension, diabetes, hirsutism, and uterine, adnexal or cervical anatomic abnormalities.

B. Laboratory Evaluation

1. Screening Pap smear, TSH, chlamydia test, and GC smear.

2. Serum FSH, LH and prolactin levels are indicated if menses are infrequent or irregular.

3. A day 2-3 FSH and estradiol level are the single best predictors of fertility potential in women; FSH values greater then 25 IU/L correlate with a poor prognosis.

4. Androgen panels are useful if hirsutism is present.

5. Pelvic sonogram may reveal uterine or adnexal abnormalities.

IV. Ovulation Assessment

A. Women who report regular menstrual cycles, with premenstrual symptoms and cyclical dysmenorrhea, are usually ovulatory. Ovulation should be confirmed with basal body temperature charting, midluteal progesterone, or detection of midcycle urine LH surge.

B. Ovulation is most easily monitored via basal body temperature charting. The woman is instructed to record her sublingual temperature on first awakening each morning. A biphasic pattern with a 0.5-1 degree temperature rise during the luteal phase allows retrospective identification of probable ovulation, though the technique is inadequately accurate for use as a guide to timed intercourse.

C. Ovulation predictor kits identify the LH surge just prior to ovulation. The kits are expensive and inconvenient, requiring testing of first morning urine on 5 sequential days, beginning 3-4 days prior to probable ovulation.

D. A luteal-phase serum progesterone level greater than 10 ng/mL provides good evidence for an ovulatory cycle, as does an endometrial biopsy, though this is seldom necessary.

E. Laboratory Evaluation of Anovulatory Patients

1. A history of irregular menses, amenorrhea, abnormal cycle lengths, or failure to confirm ovulation by any of the above tests, warrants laboratory evaluation of anovulation.
2. Measure prolactin to exclude hyperprolactinemia; measure thyroid-stimulating hormone to exclude hypothyroidism, and measure FSH and estradiol (on day 2-3) to rule out ovarian failure. If amenorrhea is present, a progesterone challenge is necessary to establish the integrity of the uterine outflow tract.

V. Luteal Phase Evaluation

A. Luteal phase length is defined as the time between ovulation and onset of menses. Luteal phase insufficiency results in an inadequate endometrial progesterone response to sustain implantation, and it may cause infertility or recurrent abortions.

B. Three luteal-phase progesterone assays with an average of less than 10 ng/mL, 5-9 days following the LH surge, are highly suggestive of luteal-phase insufficiency.

VI. Evaluation of Uterine and Tubal Factors

A. Uterine or tubal factor infertility is suggested by pelvic tenderness, masses, uterosacral nodularity, irregular uterine contour, or a history of salpingitis.

B. Hysterosalpingography is used to document tubal patency by injecting radiopaque dye into the endometrial cavity through the cervix.

1. This procedure is performed by radiologists and some gynecologists.
2. Abnormal findings include congenital malformations, leiomyomas, intrauterine synechiae (Asherman syndrome), and polyps.

C. Laparoscopy and ultrasonography may also add to the evaluation.

VII. Evaluation of Cervical Factors

A. Cervical factor infertility is suggested by a history of cone biopsy, cautery, cervicitis, or obstetric trauma.

B. Postcoital Test determines the adequacy of cervical mucus.

1. The test is performed one day after the ovulatory LH surge.
2. A cervical sample is collected 2-10 hours after intercourse.
3. Cervical mucus should demonstrate a spinnbarkheit (stretchability) of 6 mm and a ferning pattern when dried on a microscope slide. Greater than 5 motile sperm/hpf is normal.

VIII. Treatment of Infertility

A. Prepregnancy Counseling consists of an evaluation of genetic history, assessment of rubella immune status, and folic acid supplementation. Healthy life style changes should be encouraged.

B. Coital Timing

1. Time of ovulation is best estimated by subtracting the number of days of luteal phase from the estimated time of the next menses, or by adding 24-48 hours to the time of the LH surge.
2. Optimal frequency of coitus is every other day around the time of ovulation; however, comparable pregnancy rates are achieved by 3-4 times weekly intercourse throughout the cycle.

C. Treatment of Male Factor Infertility

1. Oligospermia may respond to varicocele ligation, which appears to restore fertility in up to 50% of men; azoospermia due to hypogonadism often responds to treatment with human menopausal gonadotropins or GnRH agonists following treatment with human chorionic gonadotropin.
2. The initial therapy for male factor infertility is intrauterine insemination. Retrograde ejaculation may respond to ephedrine or imipramine.

D. Treatment of Oligo-ovulation or Anovulation

1. Potentially reversible causes of anovulation (stress, weight gain or loss, drug use, strenuous physical activity) should be corrected. Adrenal disorders (Cushing syndrome or Addison disease), hyperthyroidism, hypothyroidism, liver disease, hyperprolactinemia, ovarian failure, or pregnancy should be excluded.
2. Anovulatory women with normal prolactin levels who bleed in response to a progesterone challenge are candidates for clomiphene treatment, as are women with irregular menses or midluteal serum progesterone levels of less than 10 ng/mL.
3. **Clomiphene (Clomid)** is an estrogen receptor antagonist that enhances release of pituitary gonadotropins, resulting in ovulation.
   a. 80% of patients can be expected to ovulate following treatment.
   b. **Contraindications to Clomiphene.** Preexisting ovarian cyst, ovarian enlargement, or pregnancy.
   c. Patients should be monitored for successful gestation. Menses 3-4 weeks after completion of a course of clomiphene is suggestive of ovulation, as is a basal body temperature chart with a biphasic pattern.
   d. **Dosage.** 50 mg qd on days 5-10 of the menstrual cycle; ovulation should occur 5-10 days following the last dose. The dose is increased each cycle until pregnancy is achieved or a maximum dose of 150 mg qd is reached; at this point, human chorionic gonadotropin may be given to facilitate follicle release.
   e. 40% of women will become pregnant with clomiphene therapy; there is a slightly higher-than-average multiple birth rate of 8-10%, almost always twins.
   f. **Side Effects.** Nausea, dizziness, headache, and abdominal discomfort may occur. Ovarian hyperstimulation is rare.
4. **Human Menopausal Gonadotropin**
   a. In women who have low endogenous estrogen levels, or who have failed to respond to high-dose clomiphene citrate, intramuscular human menopausal gonadotropin (Pergonal) or urofollitropin (Metrodin) may be administered to stimulate follicle development. hCG is added to induce ovum release.
   b. Pregnancy occurs at rates of 60-80%. Multiple births occur in 20%.
   c. Serial ovarian ultrasound evaluations of follicle size and serial estradiol measurements are necessary.

Sexual Dysfunction

I. Clinical Evaluation of Sexual Dysfunction

A. Sexual difficulty can be caused by a lack of communication, insufficient stimulation, a lack of understanding of sexual response, lack of a nurturing environment, physical discomfort, or fear of infection.

B. The effectiveness of sexual stimulation should be evaluated.

Classification of Sexual Dysfunction

A. Lack of Arousal

1. Difficulty becoming sexually aroused may occur if there is insufficient foreplay, or if either partner is emotionally distracted.

2. Arousal phase dysfunction may be manifest by insufficient vasocongestion.

3. Sensate Focus Exercises. In these exercises, the woman and her partner take turns caressing each other's body, except for the genital area. When caressing becomes pleasurable for both partners, they move on to manual genital stimulation, and then to further sexual activity.

B. Lack of Orgasm

1. Lack of orgasm should be considered a problem only if the patient or her partner perceives it as one. 90% of women are able to experience orgasm.

2. At-Home Methods of Overcoming Dysfunction

a. The patient should increase self-awareness by examining her body and genitals at home.

b. The patient should identify sensitive areas that produce pleasurable feelings.

c. The intensity and duration of psychologic stimulation may be increased by sexual fantasy.

d. If after completing the above steps, an orgasm has not been reached, the patient may find that the use of a vibrator on or around the clitoris is effective.

e. Once masturbation has resulted in orgasm, the patient should masturbate with partner present and demonstrate pleasurable stimulation techniques.

f. Once high levels of arousal have occurred, the couple may engage in intercourse. Manual stimulation of the clitoris during intercourse may be beneficial.

C. Dyspareunia

1. Dyspareunia consists of pain during intercourse. Organic disorders that may contribute to dyspareunia include hypoestrogenism, endometriosis, ovaries located in the cul-de-sac, fibroids, and pelvic infection.

2. Evaluation for dyspareunia should include careful assessment of the genital tract and an attempt to reproduce symptoms during bimanual examination.

D. Vaginismus

1. Vaginismus consists of spasm of the levator ani muscle, making penetration into the vagina painful. Some women may be unable to undergo pelvic examination.

2. Treatment of Vaginismus

a. Vaginal Dilators. Plastic syringe covers or vaginal dilators are available in sets of 4 graduated sizes. The smallest dilator (the size of the fifth finger) is placed in the vagina by the woman. As each dilator is replaced with the next larger size without pain, muscle relaxation occurs.

b. Muscle Awareness Exercises

(1) The examiner places one finger inside the vaginal introitus, and the woman is instructed to contract the muscle that she uses to stop urine flow. Then the woman inserts her own finger into the vagina, and the process is continued at home.

(2) Once a woman can identify the appropriate muscles, vaginal contractions can be done without placing a finger in the vagina.

E. Medications that Interfere with Sexual Function

1. The most common of medications that interfere with sexual function are antihypertensive agents, anti-psychotics, and antidepressants.

Medications Associated With Sexual Dysfunction in Women

Medication	Decreased Libido	Delayed or No Orgasm
Amphetamines and anorexic drugs		X
Cimetidine	X	
Diazepam		X
Fenfluramine	X	
Fluoxetine		X
Imipramine		X
Propranolol	X	

Urinary Incontinence

Incontinence is a symptom, not a specific disease. It presents in a limited number of clinical patterns, each having several possible causes.

I. Pathophysiology of Incontinence

A. Stress Urinary Incontinence is characterized by loss of urine with exertion, coughing, jumping, and other physical activities. It is caused by weakness of the pelvic floor muscles and lack of urethral elevation with exertion, and it is most common in premenopausal women.

B. Detrusor Instability (Urge Incontinence) is characterized by spontaneous, uninhibited bladder contractions or spasms. The disorder is usually idiopathic. It is most common in older, post-menopausal women, and it is the most common type of incontinence, accounting for 70% of cases.

C. Overflow Incontinence

1. Overdistention of the bladder causes overflow incontinence. Dribbling is especially common; however, urgency and stress symptoms may also occur.
2. The bladder may become distended as a result of detrusor inadequacy (as in diabetes) or because of physical obstruction (prostate disease in men). A large cystocele may rarely cause obstruction in women.

D. Iatrogenic Incontinence. The most common causes are use of antipsychotic agents, antihistamines, antidepressants, decongestants, diuretics, sedative-hypnotics (diazepam), and antihypertensives (alpha-blockers).

E. Other Causes of Incontinence include loss of intrinsic urethral tone, detrusor muscle hypotonicity, delirium, urinary tract infection, psychiatric disorders, endocrine disorders, and stool impaction.

Types of Urinary Incontinence

Type of Incontinence	Symptoms	Mechanism	Common Causes
Detrusor instability (Urge incontinence)	Urgency (strong desire to void)	Uninhibited detrusor contractions	Not usually caused by any neurologic deficit; detrusor hyperreflexia is often caused by stroke or multiple sclerosis
Stress Incontinence	Involuntary loss of urine during coughing, sneezing, laughing, lifting	Intrinsic sphincter deficiency. Hypermobility of bladder neck, altered angle between urethra and bladder base	Trauma (eg, surgical) to sphincter, neurologic lesion, pelvic muscle relaxation

Overflow Incontinence	Dribbling, urgency, stress	Acontractile or underactive detrusor; outlet obstruction	Diabetes, drugs, fecal impaction. In men: prostate disease In women: anti-incontinence surgery, cystocele

II. Clinical Evaluation of Incontinence

A. Determine when incontinence occurs (on way to bathroom, without warning, or during exercise, coughing, stress). Assess volume (small or large), and timing between voidings. Patients may complain of frequency, dysuria, straining, decreased stream, or incomplete emptying.

B. Assess coexisting medical problems (diabetes, neurologic disease, heart failure, genitourinary surgery, arthritis, pelvic irradiation, trauma), and medications (prescription, nonprescription).

C. Daytime or nighttime dribbling is symptomatic of overflow incontinence. Leaking associated with coughing suggests stress incontinence.

D. Neurologic causes may be associated with weakness or numbness of legs, decreased sensation, or loss of stool/flatus.

III. Physical Examination

A. Neurologic Examination. Assess peripheral sensation, motor strength, perineal sensation, sacral reflexes, and anal tone.

B. Examine for vaginal prolapse, urethral support, cystocele, and estrogen status. Hypoestrogenic atrophic vaginal changes are indicators of urethral mucosal changes. Patients should stand during examination to facilitate visualization of prolapse.

C. Rectal Examination. Rectal examination may detect abnormal anal sphincter tone, fecal impaction, or masses. In men, prostatic enlargement or asymmetry may be present.

IV. Laboratory Studies

A. Urinalysis and measurement of serum creatinine or blood urea nitrogen levels are routinely obtained. Urinalysis commonly reveals infection or, sometimes, diabetes.

B. In selected cases, urine culture, blood glucose and calcium measurements are useful.

C. Cystometry

1. The first portion of the testing requires the patient to cough three times in the upright position with a full bladder while wearing an undergarment pad. If leakage is immediate, stress incontinence is confirmed.

2. If leakage is not immediate and has a "gushing" force and a moderate to large volume, detrusor instability is present.

3. In the second portion of the testing, the patient clean-catch voids into a toilet equipped with a measuring hat. This allows direct evaluation of urinary hesitancy, stream continuity and straining, and it yields a clean specimen.

4. Next, a Foley catheter is inserted. Difficulty in inserting the catheter indicates obstruction. With the catheter in place, the patient is placed

in a supine position and the bladder is filled with sterile water in 50-mL increments, with the syringe stabilized 25 to 35 cm above the pubic symphysis. The patient is asked at what volume the first urge to void occurs, and filling continues up to the point of discomfort.

5. Normal bladder capacity is 300 to 600 mL, and the first urge to void should occur at 150 to 350 mL. If involuntary bladder contractions occur, the water in the syringe will rise.
6. The catheter is then removed, and the maneuvers to confirm stress incontinence are repeated.
7. The patient is asked to voluntarily empty her bladder. To calculate the postvoid residual urine volume, the amount of urine emptied is subtracted from the amount of water that was instilled.

D. About 20% of patients need multichannel urodynamic testing using electronic pressure catheters.

V. Treatment of Stress Incontinence

A. Nonpharmacologic Therapy

1. **Kegel Pelvic Floor Exercises.** The patient alternately contracts and relaxes the pubococcygeus muscles while urinating in teaspoonful amounts, practicing 6 times a day. Using Kegel exercises, 30-70% of women may avoid surgery.
2. **Regular and timed voiding,** every 60 minutes, progressing to every 3-4 hours, is effective in re-establishing voluntary control.
3. **Vaginal Cone-Shaped Weights** may be used to increase the strength of the pelvic floor muscles.
4. **Functional Electrical Stimulation** of the pelvic floor muscles using a vaginal or rectal probe may be used.

B. Pharmacologic Therapy

1. Drug therapy is combined with Kegel exercises as initial treatment.
2. Alpha agonists stimulate the muscle tone of the bladder outlet.
   - **a.** Phenylpropanolamine (Dimetapp tablets) 25-50 mg tid-qid.
   - **b.** Pseudoephedrine (Sudafed) 30-60 mg tid-qid.
   - **c.** Imipramine (Tofranil) 20-25 mg qd-tid.
3. Estrogen intravaginal cream (Estrace, Premarin) 2 g per day is useful if genitourinary atrophy is prominent. A combination of phenylpropanolamine and vaginal estrogen cream is effective for postmenopausal women. Oral estrogen may also be used.

C. Surgery. Periurethral injection of collagen is highly effective and safe for intrinsic urethral sphincter deficiency. Urethral suspension procedures are used for other types of stress incontinence.

VI. Treatment of Detrusor Instability

A. Non-Pharmacologic Measures. Pelvic floor muscle exercises (Kegel exercises) and a regular voiding schedule may improve symptoms.

B. Anticholinergic Medications facilitate storage of urine in the bladder.

1. Propantheline (Pro-Banthine), 15 mg PO qid.
2. Imipramine (Tofranil), 20-25 mg qd-tid; use caution over 65 years old.
3. Dicyclomine (Bentyl) 10-20 mg tid-qid [10, 20 mg]
4. Terodiline (Micturin) 12.5-25 mg bid
5. These medications have anticholinergic effects, such as dry mouth,

constipation, blurred vision, and confusion.

C. Bladder Relaxants relieve bladder spasm

1. Oxybutynin (Ditropan), 2.5-5.0 mg tid.
2. Flavoxate (Urispas) and 100-200 mg tid-qid.
3. Hyoscyamine extended release (Cystospaz) 0.375-0.750 mg bid.
4. These medications have anticholinergic effects, such as dry mouth, constipation, blurred vision, and confusion.

D. Estrogen Replacement Therapy has a therapeutic effect on detrusor instability.

1. Oral estrogen (Premarin), 0.625 mg qd.
2. Intravaginal estrogen cream (Premarin), 2 g every other day for 2 weeks, then 2 times a week. Estrogen cream is given even if the patient is already taking oral estrogen therapy.
3. Progesterone (Provera), 2.5 mg PO qd, is added in patients with a uterus.

VII. Treatment of Overflow Incontinence

A. Underlying causes should be treated, including neurologic problems that inhibit detrusor activity (eg, diabetes, vitamin B12 deficiency, herniated intervertebral disc), prostatic enlargement, urethral strictures, tumors, and certain medications.

B. Treatment. The existing obstruction should be corrected (ie, cystocele repair or prostatectomy), intermittent self-catheterization, double voiding and Crede's maneuver (manual palpation of bladder while voiding) are temporizing measures.

1. For a poorly contractile bladder, bethanechol (Duvoid, Urecholine), 20-100 mg q6h, with a temporary Foley catheter, may be effective.
2. **Alpha-blocker Agents**
   - **a.** Terazosin (Hytrin) 5-10 mg qd, increase as tolerated for outlet obstruction.
   - **b.** Prazosin (Minipress) 3-12 mg in divided doses bid-tid for bladder outlet obstruction.
3. Intermittent catheterization, suprapubic cystostomy, or a long-term indwelling catheter may be necessary.

Infectious Diseases

Urinary Tract Infection

I. Clinical Evaluation

A. Acute Uncomplicated Lower Tract Infection is associated with dysuria, urgency, and frequency without fever or back pain. Lower tract infections are most common in women in their childbearing years. Internal dysuria indicates bladder infection, external dysuria indicates vaginitis.

B. Acute Pyelonephritis is associated with fever and costovertebral angle pain and tenderness with frequency, urgency, and dysuria. Leukocytosis is often present; urinalysis reveals pyuria and bacteriuria.

II. Pathogenesis of Urinary Tract Infection

A. Enterobacteriaceae are the bacteria most often responsible. Escherichia coli causes 80% of urinary tract infections. Staphylococcus saprophyticus (Gram-positive, coagulase-negative) is the second most common, particularly in young women; the diagnosis is often missed due to low urine colony counts and negative nitrite screening.

B. Chlamydia trachomatis infection may cause dysuria, urgency, frequency, pyuria, and sterile bacterial cultures; diagnosis is by cell culture or monoclonal antibody techniques of urethral or cervical exudate.

C. Risk Factors for Urinary Tract Infection. Diaphragm or spermicide use (alters vaginal pH), sexual intercourse, elderly, anatomic obstruction, calculi.

III. Laboratory Evaluation

A. Microscopic pyuria is a nonspecific indicator of inflammation; bacteriuria confirms the diagnosis. Bacteria on microscopic examination of unspun urine correlates well with UTI.

B. Positive nitrite reading is a useful test, but false-negatives occur. False-negative and false-positives may also be seen with leukocyte esterase.

C. Culture and sensitivity testing is indicated if there is failure to respond to therapy, suspected acute pyelonephritis, or complicated infections (calculi, obstruction, diabetes, immunosuppression).

D. Follow-up post treatment culture is indicated in pyelonephritis or complicated infections. Recurrence or persistence of the same organism indicates a residual focus of infection.

IV. Treatment of Lower Urinary Tract Infection

A. Acute uncomplicated urinary tract infections can be treated with oral trimethoprim-sulfamethoxazole. A good alternative would be a fluoroquinolone. Other alternatives include an oral cephalosporin or amoxicillin, but many pathogens are resistant to amoxicillin.

B. Complicated urinary tract infections that occur repeatedly after the use of antimicrobial agents or that are acquired in hospitals are more likely to be due to antibiotic-resistant gram-negative bacilli. In more severely ill patients, treatment with a third-generation cephalosporin, ticarcillin/clavulanic acid, piperacillin/tazobactam or imipenem is recom-

mended, sometimes together with an aminoglycoside, especially if urosepsis is present.

C. A 3-day course is recommended for uncomplicated cystitis. A 7 day course is indicated if diabetes, symptoms >7 days, or elderly.

1. Trimethoprim-sulfamethoxazole (Septra) 1 double strength tab (160/800 mg) PO bid.
2. Norfloxacin (Noroxin) 400 mg PO bid.
3. Ciprofloxacin (Cipro) 250 mg PO bid.
4. Ofloxacin (Floxin) 400 mg PO bid.
5. Lomefloxacin (Maxaquin) 400 mg PO qd.
6. Levofloxacin (Levaquin) 250 mg PO qd.
7. Cefadroxil (Duricef) 500 mg PO bid.
8. Cephalothin (Keflex) 500 mg PO q6h.
9. Cefixime (Suprax) 200 mg PO bid or 400 mg PO qd.
10. Cefazolin (Ancef) 1-2 gm IV q8h.
11. Nitrofurantoin (Macrodantin) 100 mg PO qid [100 mg] or Macrobid 100 mg PO bid [100 mg].
12. Amoxicillin/clavulanate (Augmentin) 250 mg PO tid.

D. Urinary Analgesia. Phenazopyridine (Pyridium) 100 mg PO tid [100 mg]

V. Treatment of Acute Pyelonephritis

A. Parenteral antibiotics are indicated in older patients, coexistent illness (diabetes, heart disease), or for ill appearing patients.

B. Otherwise healthy, patients with uncomplicated pyelonephritis without signs of sepsis can be treated with oral trimethoprim-sulfamethoxazole. A good alternative would be an oral fluoroquinolone or an oral cephalosporin.

C. In more severely ill patients, treatment with an IV third-generation cephalosporin, ticarcillin/clavulanic acid, piperacillin/tazobactam, or imipenem is recommended, sometimes together with an aminoglycoside, especially if urosepsis is present.

D. Coverage should include gram-negative organisms and enterococci. E coli resistance to ampicillin and trimethoprim/sulfamethoxazole is increasing.

E. Antibiotic Therapy for Uncomplicated Acute Pyelonephritis

1. Treatment should be continued for 10-14 days.
2. Trimethoprim-sulfamethoxazole (Septra) 1 double strength tab (160/800 mg) PO bid or 10 mLs in 100 mLs D5W IV over two hours q12h.
3. Ciprofloxacin (Cipro) 250-500 mg PO bid or 200-400 mg IV q12h.
4. Norfloxacin (Noroxin) 400 mg PO bid.
5. Ofloxacin (Floxin) 200-400 mg PO or IV q12h.
6. Lomefloxacin (Maxaquin) 400 mg PO qd.
7. Levofloxacin (Levaquin) 250 mg PO qd.
8. Cefadroxil (Duricef) 500 mg PO bid.
9. Amoxicillin/clavulanate (Augmentin) 500 mg tab PO tid.
10. Ceftizoxime (Cefizox) 1 gm IV q8h.
11. Ceftazidime (Fortaz) 1 gm IV q8h.
12. Piperacillin/tazobactam (Zosyn) 3.375-4.5 gm IV/PB q6h.
13. Ampicillin 1 gm IV q4-6h **AND**

14. Gentamicin or tobramycin - loading dose of 100-120 mg IV (2 mg/kg); then 1.5 mg/kg IV q8h

F. Antibiotic Therapy for Complicated Acute Pyelonephritis

1. Ticarcillin/clavulanate (Timentin) 3.2 gm IV q8h.
2. Imipenem/cilastatin (Primaxin) 250-500 mg IV q6-8h.

G. Parenteral therapy should be continued for 24 hours after afebrile; oral agents should be taken to complete a 10-14 day course. If fever does not respond within 72 hours, imaging studies should be obtained to exclude obstruction, calculi, or abscesses.

VI. Recurrent Urinary Tract Infections

A. If recurrent UTI's occur, use of a diaphragm and spermicide should be discontinued, and postcoital voiding and long-term, single-dose, anti-microbial therapy may be used.

B. Long-term Suppressive Therapy. Trimethoprim/sulfamethoxazole (Bactrim, Septra), single-strength tablet 3 times weekly.

C. Self administration of a single-dose or short-term antibiotic such as trimethoprim/sulfamethoxazole may be prescribed.

VII. Indwelling Catheters

A. Antibiotic prophylaxis is not recommended while the catheter is in place; antibiotics are reserved for symptomatic infection or sepsis.

B. Bacteriuria that is acquired after short-term catheter use should be treated.

Genital Ulcer Disease

The three most common causes of sexually transmitted lesions are genital herpes, early syphilis, and chancroid. Genital herpes and syphilis are endemic. Chancroid, although common in Africa, Asia, and Latin America, is only present in certain US cities.

Causes of Genital Ulcer Disease

Cause	Percent
Herpes	60-70
Syphilis	10-20
Chancroid	0-20
Other or unknown	10-20

I. Genital Herpes

A. Serologic studies indicate that 20% of young adults have been infected with herpes simplex virus type 2.

B. Natural History

1. Acute genital herpes infections are followed by long periods of latency then reactivation.

2. The disease usually has a prodrome of itching or burning, associated with a localized erythematous patch. 1-3 mm vesicles then appear. Spontaneous rupture of the vesicles results in painful, superficial ulcerations or erosions.
3. The lesions are usually multiple and are commonly found on the glans, prepuce, and penile shaft in men and on the vulva and cervix in women.
4. The initial ulceration resolves within 10-14 days.

C. Constitutional symptoms such as fever, malaise, and painful regional lymphadenopathy often accompany primary infection.

D. Reoccurrences occur in more than 80% of patients, and they are less severe than the primary episode.

E. Laboratory Diagnosis

1. **Antigen detection** is a rapid technique that is more sensitive than culture. Viral culture requires 48-96 hours and has an accuracy rate of 85-90%.
2. Sensitivity is greatest when specimens are collected from fresh vesicles; dry, healing ulcers have a very poor yield. The sample may be collected from a vesicle that has been unroofed with a needle.

F. Treatment. Acyclovir is used for the first and recurrent episodes of genital herpes.

1. **First Clinical Episode.** Acyclovir (Zovirax), 200 mg orally five times a day or 400 mg tid for 10 days or until clinical resolution.
2. **Recurrent Episodes**
   a. Acyclovir, 400 mg orally three times a day for 5 days or
   b. Acyclovir, 800 mg orally twice a day for 5 days.

II. Early Syphilis

A. Natural History. The causative organism is Treponema pallidum. The lesions of early syphilis are infectious and those of late syphilis are not. The incubation period is 9-90 days, with a mean of 21 days.

B. Primary Syphilis

1. The first manifestation is a small macule at the site of entry, which eventually breaks down to form an ulcer. The typical ulcer (primary chancre) is usually solitary and painless and has a well-defined margin and an indurated base. Atypical chancres are common and can be indistinguishable from lesions caused by other pathogens.
2. The primary chancre is commonly found on the penis in men. In women, the ulcer may be found on the vulva, vaginal walls, or cervix. Extragenital sites such as the anus or rectum are common.
3. The ulcer is usually associated with nontender enlarged inguinal lymph nodes, which tend to be bilateral. The untreated ulcer resolves in 3 to 6 weeks.

C. Secondary Syphilis. The interval between the appearance of the primary chancre and the onset of secondary manifestations of the disease varies from 3-8 weeks.

1. Common symptoms of secondary syphilis include sore throat, malaise, headache, weight loss, fever, and musculoskeletal pains.
2. Common signs include a rash in 75-100% of patients,

lymphadenopathy in 50-86%, and mucosal ulceration in 6-30%.

3. Ulcers (mucous patches) may affect any mucous membrane, with the mouth and genitals being the most common. Ulcers are multiple and have a dull red base on a grayish slough.
4. Lesions in warm, moist areas, such as the perianal region, become enlarged and raised (condylomata lata).
5. With or without treatment, manifestations of secondary syphilis resolve.

D. Latent syphilis is characterized by an absence of clinical findings. Late syphilis is characterized by destruction of tissue, and organs, including the brain, heart, skin, and bone.

E. Laboratory Diagnosis

1. **Microscopic Examination.** A darkfield microscope will reveal spirochetes in the exudate of genital lesions. Sensitivity is 80%.
2. **Serologic Tests.** The patient's serum is first examined by nontreponemal antibody tests, such as the VDRL or rapid plasma reagin (RPR). These tests are 78-85% sensitive for primary syphilis.
3. Quantitative determination varies with the stage of syphilis and response to treatment. Non-treponemal antibodies are first detected shortly after the onset of primary syphilis and peak in number during secondary syphilis. Successful treatment results in a decline in the level of nontreponemal antibodies.
4. Because of the potential for false-positive results with these screening tests, a reactive nontreponemal test is confirmed with a fluorescent treponemal antibody absorption (FTA-ABS) test or microhemagglutination test for T pallidum (MHA-TP). These tests detect antibodies to treponemal components and remain positive for life.
5. **Treatment of Syphilis**
   a. Penicillin G benzathine is used for both primary and secondary syphilis in adults who are not allergic to penicillin; 2.4 million units IM in single dose.
   b. In nonpregnant patients allergic to penicillin, doxycycline 100 mg orally bid for 2 weeks is used.

III. Chancroid

A. 1,400 chancroid cases are reported each year, with cases concentrated in Florida, Illinois, Louisiana, New York, and Texas.

B. Natural History

1. Chancroid is caused by Haemophilus ducreyi. The incubation period is 4-7 days.
2. A small inflammatory papule appears at the portal of entry, and within 2-3 days a pustule forms that soon ruptures, resulting in a sharply circumscribed ulcer. These ulcers are usually multiple and painful, with a sloughy, purulent base, surrounded by ragged edges. The ulcers bleed easily and are not indurated.

C. Many chancroid ulcers have an atypical appearance and may be confused with other types of lesions. In men the ulcers are usually found on the penis. In women the lesions are on the labia and perineum.

D. Painful inguinal adenitis is characteristically present in 65%. It is typically unilateral, and the underlying skin is erythematous. Affected lymph nodes may rapidly become fluctuant abscesses (buboes), which rupture and form ulcers.

E. Laboratory Diagnosis. Chancroid is diagnosed by a specific culture obtained from the base of the genital lesion or from bubo aspirate.

F. Treatment

1. Azithromycin (Zithromax), 1 g orally in single dose or

2. Ceftriaxone sodium, 250 mg IM in single dose or

3. Erythromycin base, 500 mg orally four times daily for 7 days

Pubic Infections

I. Human Papilloma Virus

A. HPV is the most common tumor of the vulva. The incubation period varies from weeks to months.

B. Clinical Evaluation

1. Condyloma acuminata lesions are characterized by rough, verrucous papillomas on the genitalia.

2. Enlargement often occurs during pregnancy and sometimes lesions disappear spontaneously.

3. No practical screening tests for subclinical infection exist. Pap smear diagnosis of HPV does not correlate well with detection of HPV DNA.

C. Treatment of Genital/Perianal Warts

1. Cryosurgery with liquid nitrogen or cryoprobe is more effective than topical therapies. Lesions should be frozen until a 2 mm margin of freeze appears, then allowed to thaw, then refrozen. Repeat freeze several times.

2. Podophyllin 25% in of benzoin may be applied and washed off 4 hours later. Two or 3 applications, 1 week apart, may be needed. Podophyllin should not be used on the vagina or cervix; contraindicated in pregnancy.

3. Trichloracetic acid (80%). Apply to lesion with a cotton-tip applicator, then observe for 5-10 minutes; 2 or 3 applications may be needed, 1 week apart. Burning is common. TCA can be used on the cervix, vaginal sidewalls, and external warts; it can be used during pregnancy.

4. Podofilox 0.5% (Condylox) solution for self-treatment: Apply twice daily for 3 days followed by 4 days of no therapy. This cycle may be repeated as necessary for a total of 4 cycles; not for use on vagina or cervix; contraindicated in pregnancy.

5. Surgical excision and electrocoagulation or laser may be used.

6. Large, Bulky or Extensive Lesions

a. General anesthesia and wire loop cautery is effective.

b. Topical 5-fluorouracil cream in a 1-2% concentration has been effective in the treatment of vaginal condylomata; contraindicated in pregnancy.

7. **Recurrence rates** are high (25% within 3 months). No therapy has been proven to eradicate HPV.

D. Partner Referral

1. Examination is not required.
2. Annual Pap smears are recommended for partners, independent of wart history.
3. The use of condoms may reduce transmission to partners.

II. Molluscum Contagiosum

A. This disease is produced by a virus of the pox virus family and is spread by sexual or close personal contact.

B. Clinical Features. Lesions are usually asymptomatic, multiple, and far apart with a central umbilication. Lesions can be spread by autoinoculation and last from 6 months to many years.

C. Diagnosis. The characteristic appearance is adequate for diagnosis, but may be confirmed by biopsy.

D. Treatment. Lesions are removed by sharp dermal curette, liquid nitrogen cryosurgery, or by electrodesiccation.

III. Pediculosis Pubis (Crabs)

A. Clinical Features

1. Phthirus pubis is a blood sucking louse that is unable to survive more than 24 hours off the body.
2. It is often transmitted sexually and is principally found on the pubic hairs.
3. Severe itching may lead to excoriations and secondary bacterial infection.
4. In long-standing cases, nonblanching, blue-gray macules, averaging 0.5-1.0 cm, may appear on the abdomen and flanks.
5. **Diagnosis** is confirmed by locating nits or adult lice on the hair shafts.

B. Treatment

1. 5% permethrin cream (Elimite) is the most effective treatment; is applied for 10 minutes and washed off.
2. Kwell shampoo, lathered for at least 4 minutes, can be used; contraindicated in pregnancy or lactation.
3. All contaminated clothing and linen should be laundered.

IV. Pubic Scabies

A. This highly contagious infestation is caused by the Sarcoptes scabiei, which varies in length from 0.2-0.4 mm.

B. The infestation is transmitted by intimate contact or by infested clothing.

C. Clinical Features

1. The female mite burrows into the skin, and after 1 month, severe pruritus develops
2. A multiform eruption may develop, characterized by papules, vesicles, pustules, urticarial wheals, and secondary infections on the hands, wrists, elbows, belt line, buttocks, genitalia, and outer feet.

D. Diagnosis is confirmed by visualization of burrows and observation of parasites, eggs, larvae, or red fecal compactions under microscopy.

E. Treatment

1. Kwell cream or lotion is applied from the neck down for 8-12 hours

(contraindicated in pregnancy or lactation).

2. In infants, children under 10, in pregnant or lactating women, crotamiton 10% (Eurax) is applied to the entire body from the neck down nightly for 2 nights and washed off 24 hours after the second application.

Sexually Transmitted Diseases

I. Gonorrhea

A. Gonorrhea causes urethral, cervical, rectal, or pharyngeal infections.

B. Indications for Immediate Empiric Treatment

1. Mucopurulent cervicitis
2. Pelvic inflammatory disease
3. Contacts to GC or to presumptive GC infection
4. Treatment of partners should be provided

C. Diagnostic Labs

1. Culture is recommended for public health purposes.
2. Test of cure is not necessary.
3. Serologic testing for syphilis and HIV should be considered.

D. Recommended Treatment of Uncomplicated Infections

1. Ceftriaxone (Rocephin) 250 mg IM; active against incubating syphilis **OR**
2. Cefixime (Suprax) 400 mg po; active against incubating syphilis **OR**
3. Ciprofloxacin (Cipro) 500 mg po; contraindicated <17 years of age; not active against syphilis **OR**
4. Ofloxacin (Floxin) 400 mg po; contraindicated <17 years of age; not active against syphilis.

Plus

5. Doxycycline 100 mg po bid x 7 days; for coexisting Chlamydia trachomatis infection; may abort incubating syphilis.

E. Alternative Regimens

1. Ceftizoxime 500 mg IM, cefotaxime 500 mg IM, cefotetan 1 g IM, cefoxitin 2 g IM, cefuroxime axetil (Ceftin) 1 g po, cefpodoxime 200 mg po.
2. Enoxacin 400 mg po, lomefloxacin 400 mg po, or norfloxacin 800 mg po

plus

3. Doxycycline 100 mg po bid x 7d.

II. Chlamydia Trachomatis

A. Chlamydia may cause urethritis, cervicitis, conjunctivitis, or proctitis.

B. Diagnostic Labs

1. Culture and nonculture techniques for chlamydia are available.
2. Test of cure is not necessary if a recommended regimen was used.
3. Serologic testing for syphilis and HIV should be considered.

C. Recommended Treatment

1. Azithromycin (Zithromax) 1 g po x 1 dose **OR**
2. Doxycycline 100 mg po bid x 7 days

D. Alternative Regimens

1. Ofloxacin (Floxin) 300 mg po bid x 7 days

2. Pregnancy

a. Erythromycin base 500 mg PO qid x 7 days **OR**

b. Amoxicillin 500 mg PO tid x 10 days **OR**

c. Azithromycin (Zithromax) 1 g po x 1 dose**.**

3. Test of cure should be completed if alternative regimens are used.

Pelvic Inflammatory Disease

One in 10 women has pelvic inflammatory disease (PID) during her reproductive years. At least one-fourth of women with PID have serious sequelae, such as infertility, ectopic pregnancy or chronic pelvic pain.

PID includes endometritis, salpingitis, tubo-ovarian abscess, and pelvic peritonitis.

I. Microbiology

A. PID is usually polymicrobial, including both aerobic and nonaerobic bacteria.

B. Sexually transmissible organisms most frequently implicated include Neisseria gonorrhoeae and Chlamydia trachomatis.

C. Mycoplasma hominis and Ureaplasma urealyticum have occasionally been isolated. Escherichia coli, streptococcal species, and anaerobes, all part of the normal flora, have been implicated.

II. Diagnosis

A. The diagnosis of PID relies on a high index of suspicion. PID is correctly diagnosed on the basis of clinical and laboratory indicators in only 65% of cases. Therefore, a low threshold for initiating empiric antibiotics is essential.

B. Risk factors include multiple sex partners, frequent sexual intercourse, and the acquisition of a new sexual partner within the previous 3 months.

C. PID is characterized by diffuse lower abdominal pain that is often dull and constant, usually bilateral, and less than 2 weeks in duration.

D. An abnormal vaginal discharge, abnormal bleeding, dysuria, dyspareunia, nausea, vomiting, or fever may be present. PID is more likely to begin during the first half of the menstrual cycle.

E. Abdominal tenderness, adnexal tenderness, and cervical motion tenderness are the most frequently observed findings.

F. The presence of symptoms, lower abdominal tenderness, adnexal tenderness, and cervical motion tenderness is sufficient evidence to justify beginning empiric therapy for suspected PID.

Differential Diagnosis of PID

Appendicitis Ectopic pregnancy Hemorrhagic ovarian cyst Ovarian torsion Endometriosis Urinary tract Infection	Irritable bowel syndrome Somatization Gastroenteritis Cholecystitis Nephrolithiasis

III. Laboratory Evaluation

A. Laboratory studies may be entirely normal. An elevated leukocyte count does not distinguish PID from other diagnoses.

B. Cervical cultures for gonorrhea or Chlamydia require 3-7 days for results.

C. Despite the good specificity of nonculture tests (eg, Chlamydiazyme, Sure Cell Chlamydia), sensitivity remains less than optimal.

D. Human immunodeficiency virus (HIV) and syphilis testing should be recommended for patients with suspected PID.

E. Pelvic ultrasonography can detect pelvic abscesses.

F. Laparoscopy is the "gold standard" for diagnosing PID, and it is recommended when the diagnosis is unclear or when the patient fails to improve.

IV. Treatment and Supportive Care

A. Antibiotic Therapy should be initiated as soon as the diagnosis of PID is suspected, usually before culture results are available.

B. CDC Guidelines for Outpatient Treatment of PID

1. Ceftriaxone-Doxycycline Regimen

a. Ceftriaxone (Rocephin), 250 mg IM (or other parenteral third-generation cephalosporin), or Cefoxitin (Mefoxin), 2 gm IM plus probenecid (Benemid), 1 gm PO in a single dose
Plus

b. Doxycycline (Vibramycin), 100 mg PO bid for 14 days.

2. Ofloxacin-Clindamycin Regimen

a. Ofloxacin (Floxin), 400 mg PO bid for 14 days
Plus

b. Clindamycin (Cleocin), 450 mg PO qid, or metronidazole (Flagyl), 500 mg PO bid, for 14 days.

C. CDC Guidelines for Inpatient Treatment of PID

1. Cefoxitin-Doxycycline Regimen

a. Cefoxitin (Mefoxin), 2 g IV q6h, or cefotetan (Cefotan), 2 g IV q12h
Plus

b. Doxycycline (Vibramycin), 100 mg IV q12h.

2. Clindamycin-Gentamicin Regimen

a. Clindamycin (Cleocin), 900 mg IV q8h
Plus

b. Gentamicin (Garamycin), loading dose 2 mg/kg IV/IM , followed by 1.5 mg/kg IV/IM q8h.

3. Intravenous therapy should be continued for at least 48 hours after

clinical improvement. Thereafter, **doxycycline**, 100 mg PO bid, is given for a total of 14 days. If tubo-ovarian abscess is present, clindamycin is used for continued therapy, rather than doxycycline.

4. The cefoxitin-doxycycline regimen is superior if Chlamydia is suspected as the primary pathogen.
5. The clindamycin-gentamicin regimen has the advantage when more effective anaerobic coverage is desired, such as in patients with suspected tubo-ovarian or pelvic abscesses.
6. Adequate hydration and analgesia should also be provided.

D. Partner Referral. Sexual contacts should be treated for GC and Chlamydia, without regard to clinical or laboratory results.

Vaginal Infections

I. Clinical Evaluation of Vaginal Symptoms

A. The type and extent of symptoms, such as itching, discharge, odor, or pelvic pain should be determined.

B. A change in sexual partners or sexual activity, changes in contraception method, medications (antibiotics), and history of prior genital infections, in the patient or partner, should be noted. The possibility of pregnancy should be assessed.

C. Physical Examination

1. Examine for lesions on the perineum, vulva, vagina or cervix.
2. The color, texture, and odor of vaginal or cervical discharge is noted.
3. **Saline Wet Mount**
   - **a.** Use one swab to obtain a sample from the posterior vaginal fornix, obtaining a "clump" of discharge. Place the sample on a slide, add one drop of normal saline, and apply a coverslip.
   - **b.** Coccoid bacteria and clue cells (bacteria-coated, stippled, epithelial cells) are characteristic of bacterial vaginosis.
   - **c.** Trichomoniasis is confirmed by identification of trichomonads--motile, oval flagellates. White blood cells are prevalent.
4. **Potassium Hydroxide (KOH) Preparation**
   - **a.** Place a second sample on another slide. One drop of 10% potassium hydroxide (KOH) and a coverslip are applied. A pungent, fishy odor upon addition of KOH--a positive whiff test--strongly indicates bacterial vaginosis.
   - **b.** The KOH prep may reveal Candida in the form of thread-like hyphae and budding yeast.
5. **Cultures** are not routinely indicated.

D. Screening for STDs. Testing and treatment for gonorrhea and chlamydial infection should be considered for women with either a new sexual partner, purulent cervical discharge, or cervical motion tenderness.

II. Differential Diagnosis

A. The most common cause of vaginitis is bacterial vaginosis, followed by Candida albicans, with trichomoniasis on the decline.

B. Common nonvaginal etiologies include contact dermatitis from spermicidal creams, latex in condoms, or douching. Any STD can produce vaginal discharge.

III. Bacterial Vaginosis

A. Bacterial vaginosis develops when a shift in the normal vaginal ecosystem results in replacement of the usually predominant lactobacilli with mixed bacterial flora. Bacterial vaginosis is the most common type of vaginitis.

B. Transmission is both sexual and non-sexual.

C. There is usually little or no inflammation of the vulva or vaginal epithelium. There is little itching, no pain, and the symptoms tend to have an indolent course with chronic vaginal discharge and a "fishy" postcoital odor.

D. Diagnostic Findings

1. Clue cells (saline slide shows epithelial cells stippled with bacteria).

2. Positive whiff test (fishy odor with KOH).

3. Homogeneous, white, adherent discharge.

4. Culture has a poor specificity.

E. Treatment Regimens

1. Metronidazole (Flagyl) 500 mg bid x 7 days. A single oral dose of 2 g has a lower cure rate than the 7 day regimen.

a. Side Effects. Nausea, heartburn, metallic taste. Emetic effect with alcohol (Antabuse effect).

b. Contraindicated in the first trimester of pregnancy because of a small teratogenic potential.

2. Topical Therapies

a. Topical therapies have a 90% cure rate. Mineral oil base may weaken latex condoms and contraceptive diaphragms.

b. Metronidazole gel (MetroGel), one applicatorful (5 g) bid, morning and evening, for 5 days.

c. Clindamycin cream, 2% (Cleocin), one applicatorful (2 g) at bedtime for 7 nights.

3. Routine treatment of sexual partners is not necessary, but is sometimes helpful for patients with frequent recurrences.

4. Evaluate for other STD's.

5. Multiple recurrences are not uncommon (30% within 3 mos).

F. Persistent Cases. Reevaluate and exclude other infections, including trichomonas.

1. Clindamycin, 300 mg orally bid for 7 days.

2. Treat sexual partners.

IV. Candida Vulvovaginitis

A. Candida is the second most common diagnosis associated with vaginal symptoms. It is found in 25% of asymptomatic women. Fungal infections account for less than 33% of all vaginal infections.

B. Possible Risk Factors. Use of oral contraceptives, antibiotics, diabetes, intestinal colonization by candida, tight clothing, and immunologic defects.

C. Symptoms and Signs. Marked itching, thick, white, odorless discharge; vulvar or vaginal erythema. Thrush appears as white plaques loosely attached to mucous membranes.

D. Potassium Hydroxide Preparation reveals hyphae or budding yeast.

Rapid tests for Candida antigens are more sensitive than KOH preparation.

E. Candida on Pap smear is specific but not sensitive.

F. Treatment of Candida Vulvovaginitis

1. For severe symptoms and chronic infections, a 7-day course of treatment is used, instead of a 1 day or 3 day course. If there is extensive vulvar involvement, a cream is used instead of a suppository.

a. Terconazole (Terazol 7), 0.4% cream, one applicatorful intravaginally for 7 nights; or (Terazol 3) 0.8% cream, one applicatorful intravaginally for 3 nights; or 80 mg suppository, 1 suppository for 3 nights; terconazole is a triazole, which is superior to treatment with other topical agents.

b. Butoconazole (Femstat) 2% cream, one applicatorful intravaginally for 3-6 nights.

c. Miconazole (Monistat 7) 2% cream, one applicatorful intravaginally for 7 nights (OTC); or 200 mg vaginal suppository, one suppository for 3 nights; or 100 mg vaginal suppository, one suppository for 7 nights (OTC).

d. Clotrimazole (Gyne-Lotrimin) 1% cream, one applicatorful intravaginally for 7 nights; or 100 mg vaginal tablet for 7 nights (OTC); or 100 mg vaginal tablet, two tablets for 3 nights; or 500 mg vaginal tablet, one tablet single application.

e. Creams and suppositories are oil-based and may weaken latex condoms and diaphragms.

2. Pregnancy: Miconazole or clotrimazole are used.

G. Oral Regimens for Resistant or Recurrent Candida

1. Fluconazole (Diflucan), 150 mg PO one time [150 mg].

2. Ketoconazole (Nizoral), 200 mg PO bid for 5 days.

3. Itraconazole (Sporanox), 100 mg PO qd for 3 days.

H. Resistant or Recurrent Cases

1. Reexamine and repeat topical therapy for a 14-21-day course. Oral regimens have the potential for eradicating rectal reservoirs.

2. Patients with recalcitrant disease should be evaluated for diabetes and HIV.

I. Prophylactic Regimens for Frequent Infections

1. Fluconazole (Diflucan), 100-150 mg PO once a week [100,150 mg].

2. Clotrimazole (Gyne-Lotrimin), one 500-mg vaginal tablet once a week.

3. Ketoconazole (Nizoral), 100 mg PO once a week.

J. Personal Practices. Loose-fitting, cotton undergarments and use of sanitary napkins rather than tampons are recommended. Patients should be advise against douching.

V. Trichomonas Vaginitis

A. Trichomonas, a flagellated anaerobic protozoan, is a sexually transmitted disease with a high transmission rate. Non-sexual transmission is possible because the organism can survive a few hours in a moist environment.

B. This disease elicits severe vaginal and vulvar itching and irritation, dysuria, dyspareunia, and an abnormal vaginal odor.

C. Fiery red vaginal mucosa and a profuse, yellow-green, bubbly, vaginal discharge is common. A strawberry cervix (scattered red macules) is uncommonly seen. The disease is asymptomatic in 50% of women and 90% of men.

D. Diagnosis. Motile trichomonads are observed on normal saline preparation; >10 white blood cells per high-power field is common. Diagnosis of trichomonas by Pap smear is unreliable and should be confirmed with a saline preparation. Culture documentation is usually not required.

E. Treatment of Trichomonas Vaginitis

1. Metronidazole (Flagyl), 2 g PO in a single dose for both the patient and sexual partner, or 500 mg PO bid for 7 days, or 250 mg tid for 7 days; should be taken with food to avoid GI upset.
2. Topical therapy is not recommended because the organism may persist in the urethra and Skene's glands after local therapy.
3. Evaluate for coexisting sexually transmitted diseases.
4. **Persistent Cases.** Consider noncompliance, reinfection, metronidazole resistance, inaccurate diagnosis, or infection with multiple sexually transmitted diseases.
5. If persistence of trichomonas occurs, the patient and partner are retreated using standard dosages. Higher dosages of metronidazole, 2 g PO qd for three days or 500 g PO bid for 14 days with intravaginal metronidazole gel (MetroGel), 5 g intravaginally bid for 5 days, may be necessary.
6. **Pregnancy.** Clotrimazole 100 mg vaginally qhs x 7-14 d.

VI. Other Diagnoses Causing Vaginal Symptoms

A. One-third of patients with vaginal symptoms will not have laboratory evidence of bacterial vaginosis, Candida, or trichomonas.

B. Other causes of the vaginal symptoms should be considered, including cervicitis, allergic reactions, and vulvodynia.

C. Atrophic Vaginitis should be considered in postmenopausal patients. The mucosa appears pale and thin; wet-mount findings will be negative. Topical estrogen cream is applied; it is usually taken concomitantly with oral hormone replacement.

D. Allergy is an unusual cause of vaginal symptoms, sometimes resulting from Candida or semen allergy. Systemic antihistamines may be helpful.

Gynecologic Oncology

Cervical Cancer

Cervical cancer is the third most common female genital tract cancer. The peak age of occurrence is 45-50 years, with a range extending from the late teens to the elderly.

I. Clinical Evaluation of Possible Cervical Cancer

- **A.** Abnormal vaginal bleeding or discharge are the most common symptoms of cervical cancer. Excessively heavy or prolonged menses may be noted. Post-coital bleeding is less frequent. Sometimes a malodorous discharge is the only symptom.
- **B.** Pelvic or sciatic pain, difficulty in voiding, and leg edema may develop late in the disease.
- **C.** Exophytic growths often bleed on contact. However, the malignancy may sometimes develop entirely within the endocervical canal, and the cervix may appear normal. The cancer may also appear as a small, shallow, ulcerative crater.
- **D.** Palpation may demonstrate a very hard, indurated, ballooned or barrel-shaped cervix.
- **E.** The Pap smear often provides the first indication of cancer. Because the results of cervical cytology testing may be falsely negative in 15-40% of patients with invasive carcinoma, cervical biopsy should be done on all clinically suspicious lesions.
- **F.** When cervical cytologic findings indicate the presence of invasive carcinoma or cervical intraepithelial neoplasia, but no lesion is visible on the cervix, the malignancy may be detected by colposcopically directed biopsy. In instances where cytology suggests cervical neoplasia but there is no colposcopically visible lesion, conization of the cervix with fractional dilation and curettage is necessary.
- **G.** Conization is indicated if the cytology suggests neoplasia in the following instances:
  1. There is no lesion visible colposcopically.
  2. The atypical epithelium extends up the cervical canal beyond visualization.
  3. Results of colposcopically directed biopsy do not account for the abnormal cells found by Pap smear.
  4. Microinvasion is apparent on cervical punch biopsy.
  5. Endocervical curettage identifies cervical intraepithelial neoplasia.

II. Staging of Cervical Cancer

- **A.** Cervix cancer is the only clinically staged cancer. The clinical stage is determined primarily by inspection and palpation of the cervix, vagina and pelvis, and by examination of extra-pelvic areas, particularly the abdomen (liver) and supraclavicular nodes.
- **B.** The qualities of the cervix (eg, exophytic or endophytic with smooth

ectocervix; soft or hard) and size of lesion are noted.

C. The entire vagina is palpated to determine whether disease has spread to the upper two-thirds of the vagina (stage IIA) and if it involves the lower one-third of the vagina (stage IIIA). Extension of tumor into the parametrial tissues (stage IIB) or from the cervix to the pelvic sidewall (stage IIIB) can be diagnosed by bimanual rectovaginal examination.

D. Chest X-ray and intravenous pyelography are used to assess the extent of disease.

E. CT scan may evaluate adenopathy, status of ureters, and determine kidney location for radiation therapy planning.

F. Preoperative labs include a CBC and blood chemistry.

G. Cystoscopy, proctoscopy, barium enemas, liver and bone scans, and skeletal surveys are not required unless indicated by symptoms and physical findings.

Staging of Cervical Cancer

Stage	Definition
Stage 0	Carcinoma in situ, intraepithelial carcinoma
Stage I	The carcinoma is confined to the cervix
Stage IA1	<3 mm invasion in depth, no wider than 7 mm
Stage IA2	>3 mm invasion in depth but <5 mm, no wider than 7 mm
Stage IB1	>5 mm invasion, cervix measure no greater than 4 cm ("optimal")
Stage IB2	>5 mm invasion, cervix measure >4 cm ("suboptimal")
Stage II	The carcinoma extends beyond the cervix but has not extended to the pelvic wall
Stage IIA	Involves upper 2/3 of vagina
Stage IIB	Obvious parametrial involvement
Stage III	The carcinoma has extended to the pelvic wall. On rectal examination, there is no cancer-free space between the tumor and the pelvic wall. The tumor involves the lower third of the vagina. All cases with a hydronephrosis are included.
Stage IIIA	Lower third of vagina
Stage IIIB	Extension to the pelvic wall or lower third of vagina
Stage IV	Extension of the carcinoma beyond the pelvis.

III. Management of Stage IA Cervical Cancer

A. Microinvasive Disease (Stage IA1)

1. A cone biopsy is required for definitive diagnosis.

2. If margins are negative, and there is less than 3 mm invasion, and there is no lymphovascular space involvement, and the patient desires to retain her uterus, the patient can be followed. Alternatively, a simple hysterectomy may be elected. The cure rate should be 100% for these patients.

B. Conservative surgery may not be appropriate for invasion of 3.1-5 mm (IA2).

IV. Management of Invasive Cancers

A. For early (stage IB/IIA) optimal cancers, radiation therapy or radical hysterectomy is completed.

B. For bulky (suboptimal) stage IB cancers, radiation is usually offered.

C. Stage IIB, III, and IVA cervical cancer are treated with external pelvic irradiation and intracavitary irradiation.

D. Chemosensitization, periodic chemotherapy followed by radiation, may improve survival.

Endometrial Cancer

Endometrial cancer is the most common gynecologic malignancy. 2-3% of women will develop endometrial cancer at some time during their lives.

I. Risk Factors

A. Endometrial cancer is predominantly a disease of postmenopausal women. When endometrial cancer develops before age 40, it occurs most often in women who are obese or chronically anovulatory.

B. The principal risk factor for endometrial cancer is chronic, unopposed estrogen exposure, due to early menarche, late menopause, obesity, chronic anovulation, estrogen-secreting ovarian tumors, or treatment with unopposed estrogen.

C. Other factors that have been associated with endometrial cancer include pelvic radiation and breast or ovarian cancer.

II. Diagnosis

A. 90% of patients present with abnormal uterine bleeding occurring after menopause. Only 1-5% present with abnormal cells on Pap smear.

B. Endometrial cancer should be suspected in postmenopausal women who have any bleeding, and in perimenopausal women who have increased menstrual flow, a decreased menstrual interval, or intermenstrual bleeding.

C. The Pap smear cannot be relied upon to detect endometrial cancer. However, endometrial cancer should be suspected when atypical endometrial cells are found in the Pap smear of a nonpregnant woman of any age, or when normal endometrial cells are found in a postmenopausal woman not taking estrogens.

D. Evaluation of Suspected Endometrial Cancer

1. A Pap smear of the ectocervix and endocervix should be completed.

2. The uterus, adnexa, cervix, vagina, and rectum should be palpated by bimanual rectovaginal exam for masses, nodularity, induration, and immobility.

3. Endometrial sampling with a Pipelle aspirator is indicated in postmenopausal women with vaginal bleeding or perimenopausal women with a menstrual abnormality.

4. Suspicious lesions are biopsied.

5. A stool occult blood test is completed.
6. Endocervical curettage is necessary because endocervical carcinoma can missed by endometrial biopsy.

E. If the endometrial biopsy has been performed and no significant abnormality was detected, no further evaluation is needed. If high-risk factors are present and the cause of the bleeding remains undiagnosed, a fractional D&C should be completed. Hysteroscopy may also be helpful to evaluate the endometrium further.

F. If endometrial cancer is diagnosed, the supraclavicular and inguinal lymph nodes and the abdomen should be examined.

G. Laboratory Evaluation of Endometrial Carcinoma

1. Two-view chest X-ray
2. Serum electrolytes, complete blood count, renal and hepatic function tests, urinalysis.
3. Other studies that may be performed, include sigmoidoscopy and barium enema, intravenous pyelogram, or colonoscopy. When a high-grade cancer is found, serum CA 125 assay and CT of the abdomen and pelvis may be helpful.

III. Staging and Management

A. Surgical staging for patients with endometrial carcinoma that is apparently confined to the uterus requires the following:

1. Abdominal laparotomy.
2. Peritoneal washings for cytology.
3. Inspection and palpation of the abdominal and pelvic organs (diaphragm, liver, omentum, retroperitoneal nodes, pelvic peritoneum).
4. Total hysterectomy and bilateral salpingo-oophorectomy.
5. A frozen section is completed to determine if invasion is present. If invasion is seen, a pelvic and paraaortic node biopsy is completed and enlarged nodes are removed.

B. FIGO Staging for Carcinoma of the Corpus Uteri

Stage IA	Tumor limited to endometrium; no invasion
Stage IB	Invasion to less than one-half the myometrium
Stage IC	Invasion to more than one-half the myometrium
Stage IIA	Endocervical glandular involvement only
Stage IIB	Cervical stromal invasion
Stage IIIA	Tumor invades serosa, and/or adnexa, and/or positive peritoneal cytology
Stage IIIB	Vaginal metastases
Stage IIIC	Metastases to pelvic and/or paraaortic nodes
Stage IVA	Tumor invasion of bladder and/or bowel mucosa
Stage IVB	Distant metastases including lymph nodes

C. Postoperative Management

1. Adjuvant radiation is offered to patients at high risk of recurrence (lymphovascular space involvement, cervical invasion).
2. **Hormone Therapy**
   a. Cancers associated with a high progesterone receptor concentration are associated with a better prognosis.

b. Hormone therapy with megestrol acetate (Megace) is offered for recurrent or metastatic disease. The response is 20-30%, with prolongation of survival for 1 year.

3. Chemotherapy. The most effective chemotherapeutic regimen includes adriamycin; however, tamoxifen (Taxol) is emerging as an effective agent. Overall responses are moderate.

IV. Serous and Clear Cell Adenocarcinomas

A. These cancers are considered in a separate category from endometrioid adenocarcinomas. They have a worse prognosis overall. Patients with serious carcinomas have a poorer survival. The 3 year survival is 40% for stage I disease.

B. Serous and clear cell carcinomas are staged like ovarian cancer. A total abdominal hysterectomy and bilateral salpingo-oophorectomy, lymph node biopsy, omental biopsy/omentectomy are completed. Washings from the pelvis, gutters and diaphragm are obtained, and the diaphragm is sampled and peritoneal biopsies completed.

Ovarian Cancer

One in 70 women will develop ovarian cancer during her lifetime. Patients of low parity, decreased fertility, and delayed childbearing are at greater risk if they have not been using oral contraceptives. Most ovarian cancers occur in women over 50.

I. Screening

A. Most patients present with advanced-stage disease--only 30% of cases are confined to the ovaries at diagnosis.

B. Careful yearly pelvic examination remains the most effective screening method.

II. Clinical Diagnosis

A. In early ovarian cancer there are usually no symptoms. Symptoms occur late and include fatigue, abdominal distention, anorexia, early satiety, nausea, constipation, urinary frequency, and shortness of breath caused by pleural effusion or massive ascites.

B. Estrogen production by certain stromal tumors may cause abnormal uterine bleeding.

C. The most frequently noted physical symptoms are pelvic pain and ascites associated with a pelvic mass.

D. An adnexal mass that is bilateral, irregular, solid, or fixed is suggestive of malignancy. Ascites or a nodular cul-de-sac also suggest malignancy.

E. The risk of ovarian cancer is significantly higher in premenarcheal and postmenopausal women with an adnexal mass than in women of reproductive age.

F. Rarely, a testosterone-secreting tumor will produce physical findings of virilization.

III. Diagnostic Workup of Suspected Ovarian Cancer

A. In patients over 45 years of age, colonoscopy or a barium enema and proctoscopy is done to rule out the presence of colonic involvement or colon cancer.

B. Chest x-ray should be obtained to detect pleural effusion or metastatic disease.

C. Cervical cytology is completed to rule out cervical cancer. Endocervical and endometrial sampling is necessary if there is abnormal uterine bleeding.

D. Mammography is appropriate to exclude primary breast cancer, which may metastasize to the ovaries.

E. Ultrasound, CT, or MRI may be useful for preoperative evaluation or for assessment of disease status.

F. Tumor Markers

1. Blood plasma should be assayed for levels of circulating tumor markers in patients suspected or known to have ovarian cancer.
2. **CA 125** levels are elevated in more than 80% of patients with nonmucinous epithelial ovarian carcinomas but in only 1% of the normal population. CA 125 levels may also be elevated in endometriosis, leiomyomata, pelvic inflammatory disease, hepatitis, and malignancies other than ovarian cancer. In postmenopausal patients with pelvic masses, CA 125 levels greater than 65 U/mL are predictive of a malignancy in 75%. CA 125 is also useful for assessing response of ovarian cancer to chemotherapy and in follow-up of remission.
3. **Alpha-fetoprotein** is found in almost all endodermal sinus tumors and embryonal cell cancers and can be used in assessing therapeutic response.
4. **Human chorionic gonadotropin (hCG)** is usually elevated with trophoblastic disease but may be increased in ovarian malignancies.
5. **Lactate dehydrogenase (LDH):** Preoperative serum LDH levels are markedly elevated in patients with ovarian dysgerminoma.
6. **CA 19-9** is potentially useful in following mucinous ovarian carcinomas.
7. **Carcinoembryonic antigen (CEA)** levels, while not specific for ovarian cancer, are sometimes found to be elevated in ovarian cancer.
8. None of the tumor markers is sensitive or specific enough to be considered for routine screening.

FIGO Staging of Primary Carcinoma of the Ovary

Stage	Characteristics
I	Growth limited to one or both ovaries
IA	Growth limited to One ovary; no ascites. No tumor on the external ovarian surface; capsule intact
IB	Growth limited to Both ovaries; no ascites. No tumor on the external surfaces; capsules intact
IC	Tumor either stage IA or IB but with tumor on the surface of one or both ovaries; or with capsule ruptured; or with ascites present containing malignant cells; or with positive peritoneal washings
II	Growth involving one or both ovaries with extension to other pelvic structures
IIA	Extension and/or metastases to the uterus and/or Fallopian tubes
IIB	Extension to other pelvic tissues
IIC	Tumor either stage IIA or IIB, but with tumor on the surface of one or both ovaries; or with capsule(s) ruptured; or with ascites present containing malignant cells; or with positive peritoneal washings
III	Tumor involving one or both ovaries with peritoneal implants outside the pelvis and/or positive retroperitoneal or inguinal nodes.
IIIA	Tumor grossly limited to the true pelvis with negative nodes but with histologically confirmed microscopic seeding of abdominal peritoneal surfaces
IIIB	Tumor of one or both ovaries with histologically confirmed implants of abdominal peritoneal surfaces, none exceeding 2 cm in diameter. Nodes are negative
IIIC	Abdominal implants greater than 2 cm in diameter and/or positive retroperitoneal or inguinal nodes
IV	Growth involving one or both ovaries with distant metastasis to the liver or lungs, or malignant cells in pleural effusion.

IV. Management of Suspected Ovarian Cancer

A. Preoperative Preparation

1. Patients suspected of having ovarian cancer should be prepared for major surgery, including mechanical and/or antibiotic preparation of the bowel in the event that colon resection is necessary.
2. Prophylaxis for infection and venous thromboembolism is beneficial.

B. Operative Techniques

1. Ascites should be sent for cytopathologic evaluation. If ascites is not present, abdominal washings with saline should be obtained.

2. A Pap smear of the diaphragm should be taken, and the abdominal cavity should be explored systematically.
3. The presence or absence of nodular disease in the pelvis and abdomen should be noted.

C. Cytoreductive Surgery

1. Operative management consists of resection of as much tumor as possible. When a malignant tumor is present, a thorough abdominal exploration, total abdominal hysterectomy, bilateral salpingo-oophorectomy, node biopsy, omentectomy, and removal of all gross cancer is recommended.
2. The retroperitoneal approach is used to open the pelvic spaces and to identify the ureters.
3. All roughened or suspicious surfaces in the peritoneal cavity should be biopsied. Adhesions, particularly those around the primary tumor, should be excised and a peritoneal biopsy obtained from that site.
4. Ovarian cancer can metastasize to pelvic and paraaortic lymph nodes, and any grossly abnormal lymph nodes, should be removed.

D. Adjunctive Therapy

1. Therapy of stage I ovarian cancer consists of surgical staging, a total abdominal hysterectomy, bilateral salpingo-oophorectomy, and omentectomy. Additional therapy is indicated when the disease is poorly differentiated or malignant cells are found in ascitic fluid or peritoneal washings. Adjunctive chemotherapy or intraperitoneal chromium phosphate (32p) is used.
2. Conservative therapy may be recommended for epithelial ovarian tumors of low malignant potential.
3. Chemotherapy for patients with stages Ia and IB, grade 2 or 3, and stage Ic epithelial ovarian cancer can be either single or multi-agent. Intraperitoneal 32p is another acceptable alternative.
4. Patients with stage II epithelial ovarian cancer should be treated with intraperitoneal 32p, total abdominal irradiation, or systemic chemotherapy.
5. Stages III and IV epithelial ovarian cancers are managed with removal of as much tumor as possible, followed by postoperative combination chemotherapy.

E. Follow-up Care

1. Tumor markers are useful for postsurgical follow-up during and after adjuvant therapy.
2. Patient symptomatology, physical examination, including pelvic examination, and serial CT scans of the abdomen and pelvis are useful in tumor surveillance.

Obstetrics

Prenatal Care

I. Prenatal History and Physical Examination

A. Diagnosis of Pregnancy

1. **Amenorrhea** is usually the first sign of conception. Other early pregnancy symptoms include breast fullness and tenderness, skin changes, nausea, vomiting, urinary frequency, and fatigue.
2. **Pregnancy tests.** Urine pregnancy tests may be positive within days of the first missed menstrual period. Serum beta human chorionic gonadotropin (HCG) may be accurate up to a few days after implantation.
3. Fetal heart tones can be detected as early as 11-12 weeks from the last menstrual period (LMP) by Doppler. The normal fetal heart rate is 120-160 beats per minute.
4. Fetal movements ("quickening") are first felt by the patient at 17-19 weeks.
5. Ultrasound will visualize a gestational sac at 5-6 weeks and a fetal pole with movement and cardiac activity by 7-8 weeks. Ultrasound can estimate fetal age accurately if completed before 24 weeks.
6. **Estimated Date of Confinement.** The mean duration of pregnancy is 40 weeks from the LMP. Estimated date of confinement (EDC) can be calculated by Nägele's rule: Add 7 days to the first day of the LMP, then subtract 3 months.

B. Contraceptive History. Recent oral contraceptive usage often causes postpill amenorrhea, and may cause erroneous pregnancy dating.

C. Gynecologic and Obstetric History

1. Previous gynecologic infections or problems.
2. Gravidity is the total number of pregnancies. Parity is expressed as four numbers (term, preterm, abortions, live births).
3. The character and length of previous labors, type of delivery, complications, infant status, and birth weight are recorded.
4. Assess prior cesarean sections and determine type of C-section (low transverse or classical), and determine reason it was performed.

D. Medical and surgical history and prior hospitalizations are documented.

E. Medications and allergies are recorded.

F. Family History of medical illnesses, hereditary illness, or multiple gestation is sought.

G. Social History. Cigarettes, alcohol, or illicit drug use.

H. Review of Systems. Abdominal pain, constipation, headaches, vaginal bleeding or discharge, dysuria or urinary frequency, or hemorrhoids.

I. Physical Examination

1. Weight, funduscopic examination, thyroid, breast, lymph nodes, lungs, and heart are examined.
2. An extremity and neurologic exam are completed, and the presence

of a cesarean section scar is sought.

3. Pelvic Examination

a. Pap smear and culture for gonorrhea are completed routinely. Chlamydia culture is completed in high-risk patients.

b. Estimation of Gestational Age by Uterine Size

(1) The nongravid uterus is 3 x 4 x 7 cm. The uterus begins to change in size at 5-6 weeks.

(2) Gestational age is estimated by uterine size: 8 weeks = 2 x normal size; 10 weeks = 3 x normal; 12 weeks = 4 x normal.

(3) **At 12 weeks** the fundus becomes palpable at the symphysis pubis.

(4) **At 16 weeks**, the uterus is midway between the symphysis pubis and the umbilicus.

(5) **At 20 weeks,** the uterus is at the umbilicus. After 20 weeks, there is a correlation between the number of weeks of gestation and the number of centimeters from the pubic symphysis to the top of the fundus.

(6) Uterine size that exceeds the gestational dating by 3 or more weeks suggests multiple gestation, molar pregnancy, or (most commonly) an inaccurate date for LMP. Ultrasonography will confirm inaccurate dating or intrauterine growth failure.

c. Adnexa are palpated for masses.

II. Initial Visit Laboratory Testing

A. CBC, AB blood typing and Rh factor, antibody screen, rubella, VDRL/RPR, hepatitis B surface Ag.

B. Pap smear, urine pregnancy test, urinalysis and urine culture. Cervical culture for gonorrhea and chlamydia.

C. Tuberculosis skin testing, HIV.

D. Hemoglobin electrophoresis is indicated in risks groups, such as sickle hemoglobin in African patients, B-thalassemia in Mediterranean patients, and alpha-thalassemia in Asian patients. Tay-Sachs carrier testing is indicated in Jewish patients.

III. Clinical Assessment at First Trimester Prenatal Visits

Frequency of Prenatal Care Visits in Low-Risk Pregnancies

<28 weeks	Every month
28-36 weeks	Every 2-3 weeks
36-delivery	Every 1 week until delivery

A. Assessment at each prenatal visit includes maternal weight, blood pressure, uterine size, auscultation of fetal heart tones (after 10-12 weeks), and evaluation for edema, proteinuria, and glucosuria.

B. First Doppler heart tones should become detectable at 10-12 wks.

C. Routine prescription of prenatal vitamins is probably not necessary. Folic acid supplementation preconceptually and throughout the early part of

pregnancy has been shown to decrease the incidence of fetal neural tube defects.

D. First Trimester Education. Discuss smoking, alcohol, exercise, diet, and sexuality.

E. Headache and Backache. Acetaminophen (Tylenol) 325-650 mg every 3-4 hours is effective. Aspirin is contraindicated.

F. Nausea and Vomiting. First-trimester morning sickness may be relieved by eating frequent, small meals, getting out of bed slowly after eating a few crackers, and by avoiding spicy or greasy foods. Promethazine (Phenergan) 12.5-50 mg PO q4-6h prn or diphenhydramine (Benadryl) 25-50 mg tid-qid is useful.

G. Constipation. A high-fiber diet with psyllium (Metamucil), increased fluid intake, and regular exercise should be advised. Docusate (Colace) 100 mg bid may provide relief.

IV. Clinical Assessment at Second Trimester Visits

A. Questions for Each Follow-up Visit

1. **First detection of fetal movement** (quickening) should occur at around 17 wks in a multigravida, and at 19 weeks in a primigravida. **Fetal Movement** should be documented at each visit after 17 weeks.
2. Vaginal bleeding or symptoms of preterm labor (PTL) should be sought.

B. Fetal heart rate is documented at each visit

C. Triple Panel Screen for Neural Tube Defects (alpha fetoprotein) is completed at 15-18 weeks to screen for neural tube defects. Abnormal results are evaluated by ultrasonography and amniocentesis.

D. Amniocentesis should be offered in the second trimester if $\geq$35 yrs or if a birth defect has occurred in the mother, father, or in previous off-spring.

E. Screening ultrasound should usually be obtained at 16-18 weeks.

F. At 24-28 weeks, a one-hour glucola (blood glucose measurement 1 hour after a 50-gm oral glucose load) is obtained to screen for gestational diabetes. Those with a particular risk (eg, previous gestational diabetes or fetal macrosomia), require earlier testing. If 1 hour test result is greater than 140 mg/dL, a 3-hour glucose tolerance test is necessary.

G. Second Trimester Education. Discomforts include backache, round ligament pain, constipation, indigestion.

V. Clinical Assessment at Third Trimester Visits

A. Fetal Movement is documented. Vaginal bleeding or symptoms of preterm labor should be sought. Pregnancy induced hypertension symptoms (blurred vision, headache, rapid weight gain, edema) are sought.

B. Fetal heart rate is documented at each visit.

C. At 28-30 weeks, an antibody screen is obtained in Rh-negative women, and D immune globulin (RhoGAM) is administered.

D. At 26-30 weeks, repeat hemoglobin and hematocrit are obtained to determine the need for iron supplementation.

E. At 36 weeks, repeat serologic testing for syphilis is recommended for high risk groups.

F. Repeat third-trimester screening for gonorrhea and chlamydia is completed in high-risk patients.

G. Screening for Group B Streptococcus Colonization at 35-37 weeks

1. Lower vaginal and rectal cultures are recommended, cultures should not be collected by speculum examination. The optimal method for GBS screening is collection of a single standard culture swab or two separate swabs of the distal vagina and anorectum.
2. Oral antimicrobial agents should not be used to treat women who are found to be colonized with GBS during prenatal screening. Such treatment is not effective in eliminating carriage or preventing neonatal disease.

H. Third Trimester Education

1. **Signs of Labor.** The patient should call physician when rupture of membranes or contractions have occurred every 5 minutes for one hour.
2. **Danger Signs.** Preterm labor, rupture of membranes, bleeding, edema, signs of preeclampsia.
3. Discuss postpartum birth control, tubal ligation, pediatrician selection, child birth education classes, and labor analgesia options.
4. **Common Discomforts.** Cramps, edema, frequent urination.

I. At 36 weeks, a cervical exam may be completed. Fetal position should be assessed by palpation (Leopold's Maneuvers).

Normal Labor

Labor consists of the process by which uterine contractions expel the fetus. A term pregnancy is 37 to 42 weeks from the last menstrual period (LMP).

I. Obstetrical History and Physical Examination

A. History of the Present Labor

1. **Contractions.** The frequency, duration, onset, and intensity of uterine contractions should be determined. Contractions may be accompanied by a "bloody show" (passage of blood-tinged mucus from the dilating cervical os). Braxton Hicks contractions are often felt by many patients during the last weeks of pregnancy. They are usually irregular, mild, and do not cause cervical change.
2. **Rupture of Membranes.** Leakage of fluid may occur alone or in conjunction with uterine contractions. The patient may report a large gush of fluid or increased moisture. The color of the liquid should be determine, including blood or meconium.
3. **Vaginal bleeding** should be assessed. Spotting or blood-tinged mucus is common in normal labor. Heavy vaginal bleeding may be a sign of placental abruption.
4. **Fetal Movement.** A progressive decrease in fetal movement from baseline, should prompt an assessment of fetal well-being with a nonstress test, contraction stress test, or biophysical profile.

B. History of Present Pregnancy

1. The estimated date of confinement (EDC) is calculated as 40 weeks from the first day of the LMP.
2. The date fetal heart tones are first heard with a Doppler instrument should be 10-12 weeks from the LMP.
3. **Quickening** (maternal perception of fetal movement) occurs at about 17 weeks.
4. Uterine size before 16 weeks EGA is an accurate measure of dates.
5. Ultrasound measurement of fetal size before 24 weeks of gestation is an accurate measure of dates.
6. Uncertain gestational age requires amniocentesis to assess fetal lung maturity.
7. **Prenatal History**. Medical problems during this pregnancy should be reviewed, including urinary tract infections, diabetes, or hypertension.
8. **Review of Systems.** Severe headaches, scotomas, hand and facial edema, or epigastric pain (preeclampsia) are sought. Dysuria, urinary frequency, or flank pain may indicate cystitis or pyelonephritis.

C. Obstetrical History. Past pregnancies, durations and outcomes, preterm deliveries, operative deliveries, prolonged labors, preeclampsia, placental abruption or placenta previa, or blood loss requiring transfusion are assessed.

D. Past Medical History of asthma, hypertension, or renal disease is sought.

II. Physical Examination

A. Vital signs are assessed.

B. Head. Funduscopy should seek hemorrhages or exudates, which may suggest diabetes or hypertension. Pale conjunctivae (or nail beds) suggests anemia. Facial, hand and ankle edema suggest preeclampsia. The thyroid gland should be palpated to rule out goiter or other masses.

C. Chest. Auscultation of the lungs for wheezes and crackles may indicate asthma or heart failure.

D. Abdomen. Palpate for tenderness or masses.

E. Uterine Size. Until the middle of the third trimester, the distance in centimeters from the pubic symphysis to the uterine fundus should correlate with the gestational age in weeks. Toward term, the measurement becomes progressively less reliable because of engagement of the presenting part.

F. Estimation of fetal weight is completed by palpation of the gravid uterus.

G. Leopold's maneuvers are used to determine the position of the fetus.

1. **First Maneuver.** This maneuver determines which fetal pole occupies the uterine fundus. The breech moves with the fetal body. The vertex is rounder and harder, feels more globular than the breech, and can be moved separately from the fetal body.
2. **Second Maneuver.** The lateral aspects of the uterus are palpated to determine on which side the fetal back or fetal extremities (the small parts) are located.
3. **Third Maneuver.** The presenting part is moved from side to side. If movement is difficult, engagement of the presenting part has occurred.

4. **Fourth Maneuver.** With the fetus presenting by vertex, the cephalic prominence may be palpable on the side of the fetal small parts.

H. Pelvic Examination. The adequacy of the bony pelvis, the integrity of the fetal membranes, the degree of cervical dilatation and effacement, and the station of the presenting part are determined.

I. Extremities. Severe lower extremity or hand edema suggests preeclampsia. Deep-tendon hyperreflexia and clonus may signal impending seizures.

J. Laboratory Tests

1. Prenatal labs should be documented, including CBC, blood type, Rh determination, antibody screen, serologic test for syphilis, rubella antibody titer, urinalysis, culture, Pap smear, cervical cultures for gonorrhea and Chlamydia, and hepatitis B surface antigen (HbsAg).
2. During labor, the CBC, urinalysis, and RPR are repeated. The HBSAG is repeated for high-risk patients. A clot of blood is placed on hold.

K. Fetal Heart Rate Monitoring. The baseline heart rate, variability, accelerations, and decelerations are recorded.

Obstetrical History and Physical

Chief compliant: Contractions, rupture of bag of membranes.
HPI: ___ year old Gravida (number of pregnancies) Para (number of deliveries). Gestational age, last menstrual period, estimated date of confinement.
Contractions (onset, frequency, intensity), rupture of membranes (time, color). Vaginal bleeding (consistency, quantity, bloody show); fetal movement.
Fetal Heart Rate Strip: Baseline rate, accelerations, reactivity, decelerations, contraction frequency.
Dates: First day of last menstrual period, estimated date of confinement. Ultrasound dating. Date of first positive pregnancy test. Check records to verify that uterine size by exam has equaled dates before 16 wks; verify the date of first Doppler heart tones (10-12 wks).
Prenatal Care: Date of first exam, number of visits; has size been equal to dates? infections, hypertension, diabetes.
Obstetrical History: Dates of prior pregnancies, gestational age, route (C-section with indications and type of uterine incision), weight, complications, length of labor. Preeclampsia, abruption, preterm labor.
Gynecologic History: Menstrual history (menarche, interval duration), herpes, gonorrhea, chlamydia, abortions; use of oral contraceptives.
Past Medical History: Illnesses, asthma, hypertension, diabetes, renal or heart disease, surgeries.
Medications: Iron, prenatal vitamins.
Allergies: Penicillin, codeine?
Social History: Smoking, alcohol, drug use.
Family History: Hypertension, diabetes, tuberculosis, bleeding disorders.
Review of Systems: Severe headaches, scotomas, blurred vision, hand and face edema, epigastric pain, pruritus, dysuria, fever.

Physical Exam
General Appearance:
Vitals: BP, pulse, respirations, temperature.
HEENT: Funduscopy, facial edema, jugular venous distention.
Chest: Wheezes, rhonchi.
Cardiovascular: Rhythm, S1, S2, murmurs.
Abdomen: Fundal height, Leopold's maneuvers (lie, presentation). Estimated fetal weight (EFW), tenderness, scars.
Cervix: Dilatation, effacement, station, position, status of membranes, presentation. Vulvar herpes lesions. Digital exam is contraindicated in the presence of an premature rupture of membranes or vaginal bleeding. A sterile speculum exam for pooling, nitrazine, and ferning is completed if premature rupture of membranes is suspected.
Extremities: Cyanosis, clubbing, edema, calf tenderness.
Neurologic: Deep tender reflexes, clonus.
Prenatal Labs: Obtain results of one hour post glucola, RPR/VDRL, rubella, blood type, Rh, CBC, PAP, PPD, Hepatitis BsAg, UA, C and S.
Current Labs: Hemoglobin, hematocrit, glucose, UA; urine dipstick for protein.
Assessment: Intrauterine pregnancy (IUP) at 40 weeks, admitted with the following problems:
Plan: Anticipated type of labor and delivery. List plan for each problem.

III. Normal Labor

A. Labor is characterized by uterine contractions of sufficient frequency, intensity, and duration to result in effacement and dilatation of the cervix.
B. **The first stage of labor** starts with the onset of regular contractions and

ends with complete dilatation (10 cm). This stage is further subdivided into the latent and an active phase.

1. The latent phase starts with the onset of regular uterine contractions and is characterized by slow cervical dilatation to 4 cm. The latent phase of labor is variable in length.
2. The active phase follows and is characterized by more rapid dilatation to 10 cm. During the active phase of labor, the average rate of cervical dilatation is 1.5 cm/hour in the multipara and 1.2 cm/hour in the nullipara.

C. The second stage of labor begins with complete dilatation of the cervix and ends with delivery of the infant. It is characterized by voluntary and involuntary pushing. The average second stage of labor is one-half hour in a multipara and 1 hour in the primipara.

D. The third stage of labor begins with the delivery of the infant and ends with the delivery of the placenta.

E. Intravenous Fluids

1. IV fluid during labor is usually Ringer's lactate or 0.45% normal saline with 5% dextrose. Intravenous fluid infused rapidly or given as a bolus should be dextrose-free because maternal hyperglycemia can occur.

F. Activity. Patients in the latent phase of labor are usually allowed to walk.

G. Narcotic and Analgesic Drugs

1. In a prolonged early latent phase of labor, mild sedation with hydroxyzine (Vistaril) may be sufficient.
2. Meperidine (Demerol) 50 to 100 mg IM q3-4h or 10 to 25 mg IV q1.5-3.0 h **OR**
3. Butorphanol (Stadol) 2 mg IM q3-4h or 0.5-1.0 mg IV q1.5-2.0h **OR**
4. Nalbuphine (Nubain) 5 to 10 mg SC or IV q2-3h.
5. Narcotics should be avoided if it is anticipated that their peak action will not have diminished by the time of delivery. Respiratory depression is reversed with naloxone (Narcan): Adult 0.4 mg IV or IM and neonatal 0.01 mg/kg.

Labor and Delivery Admitting Orders

Admit: Labor and Delivery
Diagnoses: Intrauterine pregnancy at ____ weeks.
Condition: Satisfactory
Vitals: q1-4 hrs per routine
Activity: May ambulate in latent phase; bed rest in active phase.
Nursing: I and O, urine output. Catheterize prn; external or internal monitors.
Diet: NPO except ice chips.
IV Fluids: Lactated Ringers with 5% dextrose at 125 cc/h.
Labs: CBC, dipstick urine protein.
If indicated: blood type and Rh, antibody screen, VDRL, HBSAG, rubella, type and screen (C-section).
Medications:
Epidural at 4-5 cm.
Butorphanol (Stadol) 2 mg IM q3-4h or 0.5-1 mg IV q1.5-2h prn **OR**
Nalbuphine (Nubain) 5-10 mg IV/SC q2-3h prn
Meperidine (Demerol) 50-100 mg IM q3-4h or 25-75 mg slow IV q1.5-3h prn **AND**
Promethazine (Phenergan) 25-50 mg, IM, IV q3-4h prn **OR**
Hydroxyzine (Vistaril) 25-50 mg IM q3-4h prn **OR**
Fleet enema PR prn constipation.

H. Epidural Anesthesia

1. Contraindications include infection in the lumbar area, clotting defect, active neurologic disease, sensitivity to the anesthetic, hypovolemia, and septicemia.
2. Risks include hypotension, respiratory arrest, toxic drug reaction, and rare neurologic complications.
3. An epidural has no significant effect on the progress of labor.
4. Before the epidural is initiated, the patient is hydrated with 500-1000 mL of dextrose-free intravenous fluid.

I. Intrapartum Chemoprophylaxis for Group B Streptococcus Infection

1. Intrapartum chemoprophylaxis is offered to all pregnant women identified as GBS carriers by a culture obtained at a prenatal visit at 35-37 weeks.
2. If the result of GBS culture is not known at the time of labor, intrapartum chemoprophylaxis should be administered if one of the following is present: gestation <37 weeks, duration of membrane rupture $\geq$18 hours, or temperature $\geq$38°C (100.4°F).
3. Women found to have GBS bacteriuria during pregnancy should be treated at the time of diagnosis, and they should receive intrapartum chemoprophylaxis. Intrapartum chemoprophylaxis should be given to women with a history of previously giving birth to an infant with GBS disease.
4. Intrapartum chemoprophylaxis consists of penicillin G, 5 million units, then 2.5 million units IV every 4 hours until delivery. Ampicillin, 2 g initially and then 1 g IV every 4 hours until delivery, is an alternative. Clindamycin or erythromycin may be used for women allergic to penicillin.

IV. Normal Spontaneous Vaginal Delivery

A. Preparation. As the multiparous patient approaches complete dilatation or as the nulliparous patient begins to crown the fetal scalp, preparations are made for delivery.

B. Maternal Position. The mother is usually placed in the dorsal lithotomy position with left lateral tilt.

C. Delivery of a Fetus in an Occiput Anterior Position

1. **Delivery of the Head**
   - **a.** The fetal head is delivered by extension as the flexed head passes through the vaginal introitus.
   - **b.** Once the fetal head has been delivered, external rotation to the occiput transverse position occurs.
   - **c.** The nose and oropharynx of the fetus are suctioned with the bulb syringe. A finger is passed into the vagina along the fetal neck to check for a nuchal cord. If one is present, it is lifted over the vertex. If this cannot be accomplished, the cord is doubly clamped and divided.
   - **d.** If shoulder dystocia is anticipated, the shoulders should be delivered before suctioning.
2. **Episiotomy** consists of incision of the perineum, enlarging the vaginal orifice at the time of delivery. If indicated, an episiotomy should be performed when 3-4 cm of fetal scalp is visible.
   - **a.** With adequate local or spinal anesthetic in place, a medial episiotomy is completed by incising the perineum toward the anus and into the vagina.
   - **b.** Avoid cutting into the anal sphincter or the rectum. A short perineum may require a mediolateral episiotomy.
   - **c.** Application of pressure at the perineal apex with a towel-covered hand helps to prevent extension of the episiotomy.
3. **Delivery of the Shoulders.** Delivery of the anterior shoulder is accomplished by gentle downward traction on the fetal head. The posterior shoulder is delivered by upward traction.
4. **Delivery of the Body.** The infant is grasped around the back of the neck with the left hand, and the right hand is placed, near the vagina, under the baby's buttocks, supporting the infant's body. The infant's body is rotated toward the operator and supported by the operator's forearm, freeing the right hand to suction the mouth and nose. The baby's head should be kept lower than the body to facilitate drainage of secretions.
5. **Suctioning** of the nose and oropharynx is repeated.
6. **The umbilical cord** is doubly clamped and cut, leaving 2-3 cm of cord.

D. Delivery of the Placenta

1. The placenta separates spontaneously from the uterine wall within 5 minutes of delivery.
2. Gentle fundal massage and firm but gentle traction on the cord facilitates delivery of the placenta.
3. The placenta should be examined for missing cotyledons or blind

vessels. The cut end of the cord should be examined for 2 arteries and a vein. The absence of one umbilical artery suggests a congenital anomaly.

4. Prophylaxis against excessive postpartum blood loss consists of external fundal massage and oxytocin (Pitocin), 20 units in 1000 mL of IV fluid at 100 drops/minute after delivery of the placenta. Oxytocin can cause marked hypotension if administered as a bolus.
5. After delivery of the placenta, the birth canal is inspected for lacerations.

Delivery Note

1. Note the age, gravida, para, and gestational age.
2. Time of birth, type of birth (spontaneous vaginal delivery), position (left occiput anterior).
3. Bulb suctioned, sex, weight, APGAR scores, nuchal cord, and number of cord vessels.
4. Placenta expressed spontaneously intact. Describe episiotomy degree and repair technique.
5. Note lacerations of cervix, vagina, rectum, perineum.
6. Estimated blood loss:
7. Disposition: Mother to recovery room in stable condition. Infant to nursery in stable condition.

Routine Postpartum Orders

Transfer: To recovery room, then postpartum ward when stable.
Vitals: Check vitals, bleeding, fundus q15min x 1 hr or until stable, then q4h.
Activity: Ambulate in 2 hours if stable
Nursing Orders: If unable to void, straight catheterize; sitz baths prn with 1:1000 Betadine prn, ice pack to perineum prn, record urine output.
Diet: Regular
IV Fluids: D5LR at 125 cc/h. Discontinue when stable and taking PO diet.
Medications:
Oxytocin 20 units in 1 L D5LR at 100 drops/minute) or 10 U IM.
FeS04 325 mg PO bid-tid.
Symptomatic Medications:
Meperidine (Demerol) 50-75 mg IM q3-4h prn **OR**
Acetaminophen/Codeine (Tylenol #3) 1-2 tab PO q3-4h prn.
Milk of magnesia 30 mL PO q6h prn constipation.
Docusate Sodium (Colace) 100 mg PO bid.
Dulcolax suppository PR prn constipation.
Epifoam or Dermoplast at bedside.
A and D cream or Lanolin prn if breast feeding.
Breast binder or tight brazier and ice packs prn if not to breast feed.
Labs: Hemoglobin/hematocrit in AM. Give rubella vaccine if titer <1:10.

Classification and Repair of Perineal Lacerations and Episiotomies

I. First Degree Laceration

A. A first degree perineal laceration extends only through the vaginal and perineal skin.

B. Repair: Place a single layer of interrupted 3-O chromic or vicryl sutures about 1 cm apart.

II. Second Degree Laceration and Repair of Midline Episiotomy

A. A first degree laceration extends deeply into the soft tissues of the perineum, down to, but not including, the external anal sphincter capsule. The disruption involves the bulbocavernosus and transverse perineal muscles.

B. Repair

1. Identify the apex of the vaginal laceration. Suture the vaginal laceration with a running, locking 3-O chromic or vicryl suture up to the hymenal margin.

2. Pass the suture through the vaginal mucosa under the hymenal margin into the perineal body.

3. Next proximate the deep layer of the perineal body by placing 3-4 interrupted 2-O or 3-O chromic or vicryl sutures.

4. Use the previously placed vagina suture to reapproximate the superficial layers of the perineal body with a running suture extending to the bottom of the episiotomy.

5. Close the skin with the same suture in a running subcuticular fashion. Tie off the suture and remove the needle.

III. Third Degree Laceration

A. This laceration extends through the perineum and through the anal sphincter.

B. Repair

1. Identify each severed end of the external anal sphincter capsule, and grasp each end with an Allis clamp.

2. Proximate the capsule of the sphincter with 4 interrupted sutures of 2-O or 3-O vicryl suture, making sure the sutures do not penetrate the rectal mucosa.

3. Continue the repair as for a second degree laceration as above. Stool softeners and sitz baths are prescribed post-partum.

IV. Fourth-Degree Laceration

A. The laceration extends through the perineum, anal sphincter, and extends through the rectal mucosa to expose the lumen of the rectum.

B. Repair

1. Irrigate the laceration with sterile saline solution. Identify the anatomy, including the apex of the rectal mucosal laceration.

2. Approximate the rectal submucosa with a running suture using a 3-O

chromic on a GI needle extending to the margin of the anal skin.

3. Place a second layer of running suture to invert the first suture line, and take some tension from the first layer closure.
4. Identify and grasp the torn edges of the external anal sphincter capsule with Allis clamps, and perform a repair as for a third-degree laceration.
5. Close the remaining layers as for a second-degree laceration.
6. A low-residue diet, stool softeners, and sitz baths are prescribed post-partum.

Fetal Heart Rate Monitoring

Intrapartum fetal heart rate (FHR) monitoring can identify fetal hypoxia, umbilical cord compression, tachycardia, and acidosis. A normal FHR pattern is reassuring. Fetal heart rate monitoring has been shown to significantly reduce the risk of newborn seizures (relative risk 0.5); however, the risk of cesarean section is increased (relative risk 1.21).

I. Physiologic Basis of Fetal Heart Patterns

A. Uterine contractions decrease placental blood flow and result in intermittent episodes of decreased oxygen delivery.

B. The fetus normally tolerates contractions without difficulty, but if the frequency, duration, or strength of contractions becomes excessive, fetal hypoxemia may result.

II. Fetal Heart Rate Patterns

A. Variable Decelerations

1. Variable decelerations are characterized by slowing of the FHR with abrupt onset and return. They are frequently followed by small accelerations of the FHR.
2. They vary in depth, duration, and shape; they coincide with cord compression, and they usually coincide with the timing of the uterine contractions.
3. **Variable decelerations** are the most common decelerations seen in labor and indicate umbilical cord compression; they are generally associated with a favorable outcome. Persistent, deep, and long lasting variable decelerations are nonreassuring.
4. Persistent variable decelerations to less than 70 bpm, lasting more than 60 seconds are concerning.
5. Variable decelerations with persistently slow return to baseline are more considered nonreassuring, as these reflect persistent hypoxia. Nonreassuring variable decelerations are associated with the development of tachycardia absence of accelerations, and loss of variability.

B. Late Decelerations

1. Late decelerations are U-shaped with a gradual onset and gradual return. They are usually shallow (10-30 beats per minute), and they reach their nadir after the peak of the contraction.

2. Late decelerations occur when uterine contractions cause decreased fetal oxygenation. In milder cases, they can be a result of CNS hypoxia. In more severe cases, they may be the result of direct myocardial depression.
3. They may be secondary to fetal hypoxia in response to the decreased placental perfusion associated with contractions.
4. Occasional or intermittent late decelerations are not uncommon during labor. When late decelerations become persistent, they are nonreassuring.
5. Late decelerations generally become deeper as the degree of hypoxia becomes more severe.

C. A prolonged deceleration is an isolated, abrupt decrease in the FHR to levels below the baseline, for least 60-90 seconds.

1. These changes are concerning and may be caused by fetal hypoxia.
2. The degree to which such decelerations are nonreassuring depends on their depth and duration, loss of variability, and the frequency and progression of recurrence.

D. Sinusoidal heart rate pattern consists of a regular oscillation of the baseline long-term variability, resembling a sine wave.

1. This smooth, undulating pattern, lasting at least 10 minutes, has a relatively fixed period of 3-5 cycles per minute and an amplitude of 5-15 bpm above and below the baseline. Short-term variability is absent.
2. This rare pattern may be associated with severe chronic, fetal anemia, severe hypoxia and acidosis.

E. Early Decelerations

1. Early decelerations are shallow and symmetrical with a pattern similar to that of late decelerations, but they reach their nadir at the same time as the peak of the contraction.
2. These decelerations occur in the active phase of labor, and are benign changes caused by fetal head compression.

F. Fetal Heart Rate

1. The FHR at term ranges from 120-160 bpm. The initial response of the FHR to intermittent hypoxia is deceleration, but baseline tachycardia may develop if the hypoxia is prolonged and severe.
2. Tachycardia may also be associated with maternal fever, intra-amniotic infection, and congenital heart disease.

G. Variability of Fetal Heart Rate

1. Decreasing fetal heart rate variability is a fetal response to hypoxia.
2. Fetal sleep cycle or medications may decrease the variability of the FHR.
3. The development of decreased variability in the absence of decelerations is unlikely to be due to hypoxia.

H. Accelerations

1. Accelerations are common periodic changes in labor. They are usually associated with fetal movement.
2. These changes are reassuring and almost always confirm that the fetus is not acidotic.

III. Fetal Heart Rate Monitoring Method

A. Continuous FHR and contraction monitoring may be accomplished externally or internally. Internal FHR monitoring is accomplished with a spiral wire directly on the fetal scalp or other presenting part.

B. Uterine contractions are monitored externally or internally.

C. The paper speed is usually 3 cm/min.

IV. Management of Nonreassuring Patterns

A. Approach to a Nonreassuring Pattern

1. Determine the etiology of the pattern.
2. Attempt to correct the pattern by correcting the primary problem or by instituting measures aimed at improving fetal oxygenation and placental perfusion.
3. If attempts to correct the pattern are not successful, consider fetal scalp blood pH assessment.
4. Determine whether operative intervention is warranted.

B. Late decelerations. Excessive uterine contractions, maternal hypotension, or maternal hypoxemia should be corrected.

C. Severe variable or prolonged decelerations

1. A pelvic examination is performed to rule out umbilical cord prolapse or rapid descent of the fetal head.
2. If no causes are found, umbilical cord compression is likely to be responsible.

D. Measures that improve fetal oxygenation and placental perfusion

1. **Oxygen Therapy.** Maternal oxygenation may be increased by giving oxygen at a flow rate of 8-10 L/min with a tight-fitting face mask.
2. **Maternal Position**
   - **a.** In the supine position, the vena cava and aortoiliac vessels are compressed by the gravid uterus. This results in decreased return of blood to the maternal heart leading to a fall in uterine blood flow.
   - **b. The lateral recumbent position** (either side) is best for maximizing cardiac output and uterine blood flow, and it is often associated with an improvement in the FHR.
3. **Oxytocin (Pitocin)**
   - **a.** If nonreassuring FHR changes occur in patients receiving oxytocin, the infusion should be discontinued.
   - **b.** Restarting the infusion at a lower rate may be better tolerated.
4. **Intravenous Hydration.** If the mother is hypovolemic, intravenous

hydration should be initiated.

5. **Amnioinfusion**
   - **a.** Variable decelerations that occur prior to fetal descent at 8-9 cm of dilatation are most frequently caused by oligohydramnios.
   - **b.** Replacement of amniotic fluid with normal saline infused through an intrauterine pressure catheter decreases variable decelerations in patients with decreased amniotic fluid volume.
   - **c.** In patients with oligohydramnios, amniotic fluid may be replaced prophylactically at the onset of labor.
   - **d.** Saline amnioinfusion also a decreases newborn respiratory complications from meconium due to the dilutional effect of amnioinfusion.
   - **e.** Continuous amnioinfusion usually begins with a loading dose of 10 mL/min for 1 hour followed by a maintenance dose of 3 mL/min with an infusion pump through a double-lumen uterine pressure catheters.
6. **Tocolytic Agents**
   - **a.** If a nonreassuring FHR pattern results from excessive uterine contractions, uterine activity can be decreased with tocolytics.
   - **b.** Terbutaline, 0.25 mg subcutaneously or 0.125-0.25 mg intravenously, will suppress contractions. Magnesium sulfate is also of value in rapidly providing uterine relaxation and improving fetal condition.
   - **c.** Even in the absence of excessive uterine contractions, newborn condition may be improved by tocolytic agents.

Intrapartum Fetal Resuscitation for Variant Heart Rate Patterns

1. Change to lateral decubitus.
2. 100% oxygen via mask.
3. Discontinue oxytocin.
4. Vaginal exam to rule out cord prolapse or imminent delivery.
5. Correct hypotension with IV fluids.
6. Suppress contractions with terbutaline sulfate, 0.25 mg SC.
7. Administer a scalp or sound stimulation test or obtain a scalp pH.
8. Amnioinfusion via intrauterine pressure catheter (for variable decelerations).

V. Management of Persistent Nonreassuring Fetal Heart Rate Patterns

- **A. Persistent nonreassuring decelerations with normal FHR variability and absence of tachycardia** generally indicate the lack of fetal acidosis.
- **B. Persistent late decelerations or severe variable decelerations associated with absence of variability** are always nonreassuring and generally require prompt intervention unless they spontaneously resolve or can be corrected rapidly with conservative measures (oxygen, hydration, maternal repositioning). In the presence of nonreassuring decelerations, a fetal scalp electrode should be placed.
- **C. Spontaneous accelerations** of greater than 15 bpm, lasting at least 15

seconds indicate the absence of fetal acidosis. Fetal scalp stimulation or vibroacoustic stimulation can be used to induce accelerations. If the fetus fails to respond to stimulation in the presence of an otherwise nonreassuring pattern, there is a 50% chance of acidosis.

D. In cases in which the FHR patterns are persistently nonreassuring, the fetus should be delivered by either cesarean section or vaginal delivery.

Fetal Heart Rate Monitoring Diagnoses

FHR Pattern	Diagnosis	Action
Normal rate, normal variability, accelerations, no decelerations	Fetus is well oxygenated	None
Normal variability, accelerations, mild variant pattern (bradycardia, late decelerations, variable decelerations)	Fetus is still well oxygenated centrally	Conservative management. This variant pattern should reverse if cause is reversed
Normal variability, ± accelerations, moderate-severe variant pattern (bradycardia, late decelerations, variable decelerations)	Fetus is still well oxygenated centrally, but the FHR pattern suggests reductions in O_2	Continue conservative management. Consider amnioinfusion and/or stimulation testing. Prepare for rapid delivery if pattern worsens
Decreasing variability, ± accelerations, moderate-severe variant patterns (bradycardia, late decelerations, variable decelerations)	Fetus may be on the verge of decompensation	Deliver if spontaneous delivery is remote, or if stimulation supports diagnosis of decompensation. Normal response to stimulation may allow time to await a vaginal delivery
Absent variability, no accelerations, moderate/severe variant patterns (bradycardia, late decelerations, variable decelerations)	Evidence of actual or impending asphyxia	Deliver. Stimulation or in-utero management may be attempted if delivery is not delayed

Antepartum Fetal Surveillance

The most commonly used antepartum tests for fetal well being are the contraction stress test (CST), the nonstress test (NST), the biophysical profile (BPP), the modified biophysical profile (MBPP), and fetal movement assessment (ie, kick counts).

I. Contraction Stress Test

A. The CST evaluates the response of the fetal heart rate to uterine contractions.

B. The CST relies on the assumption that when fetal oxygenation is only marginally adequate with the uterus at rest, oxygenation will be transiently worsen when uterine contractions occur. The intermittent fetal hypoxemia during contractions leads to late decelerations of the fetal heart rate.

C. Persistent late decelerations are a reliable indicator of suboptimal fetal oxygenation.

D. Uterine contractions may also produce variable decelerations due to cord compression, suggesting oligohydramnios.

E. Contraction Stress Test Technique

1. The fetal heart rate and contraction activity is monitored, and a baseline tracing is obtained. The test is considered satisfactory if at least 3 contractions of 40 seconds duration or more are present in a 10-minute period. If fewer than 3 contractions of at least 40 seconds duration occur during the 10 minute period, contractions are induced with either nipple stimulation or intravenous oxytocin.

2. Nipple stimulation is usually successful in inducing an adequate contraction pattern. The woman is instructed to rub one nipple gently, through her clothing, for 2 minutes or until a contraction begins.

3. Oxytocin may also be used to stimulate contractions by infusing it at 0.5-1.0 mU/min, doubled every 15-20 minutes until an adequate contraction pattern occurs.

F. Interpretation of CST Results

1. Negative. No late decelerations

2. Positive. Late decelerations following 50% or more of contractions, even if the contraction frequency is less than 3 in 10 minutes.

3. Suspicious (equivocal). Intermittent late or significant variable decelerations.

4. Unsatisfactory. Fewer than 3 contractions per 10 minutes.

G. Relative Contraindications to CST:

1. Preterm labor or certain patients at high risk for preterm labor

2. Preterm rupture of membranes

3. Classical uterine incision scar

4. Known placenta previa

II. Nonstress Test

A. The NST is based on the premise that the heart rate of a well-oxygenated fetus will temporarily accelerate with fetal movement.

B. Heart rate reactivity is a good indicator of fetal autonomic function; loss

of reactivity is associated most commonly with a sleep cycle but may also result from fetal acidosis.

C. Nonstress Test Technique

1. A fetal heart monitor is applied, and the tracing is observed for fetal heart rate accelerations of at least 15 beats per minute above the baseline and lasting 15 seconds. The tracing may be continued for 40 minutes.
2. Acoustic stimulation may elicit fetal heart rate accelerations if the fetus is not acidotic.

D. Interpretation

1. The NST is considered reactive (normal) if there are two or more fetal heart rate accelerations within a 20-minute period.
2. A nonreactive tracing is one without sufficient fetal heart rate accelerations over a 40-minute period.

III. Biophysical Profile

A. Biophysical profile testing consists of an NST with the addition of four ultrasound observations. The five components are as follows:

1. Reactive NST
2. Fetal breathing movements (one or more episodes of rhythmic fetal breathing movements of 30 seconds or more within 30 minutes).
3. Fetal movement (3 or more discrete body or limb movements within 30 minutes).
4. Fetal tone (1 or more episodes of extension of a fetal extremity with return to flexion).
5. **Quantitation of Amniotic Fluid Volume**
   - **a.** The amniotic fluid index consists of an assessment of amniotic fluid depth in four quadrants.
   - **b.** The five observations is assigned a score of 2 (normal) or 0 (abnormal). A total score of 8 or 10 is normal; a score of 6 is considered equivocal (retest in 12-24 hours); a score of 4 or less is abnormal.

B. Modified Biophysical Profile

1. This test consists of a nonstress test and an amniotic fluid index. An NST is a short-term indicator of fetal acid-base status, and amniotic fluid index is an indication of long-term placental function.
2. The modified biophysical profile is a less cumbersome than complete BPP assessment and appears to be equivalent in establishing the likelihood that fetal death will not occur.

IV. Assessment of Fetal Movement

A. This test is performed by the patient at home by having the her lie on her side and count distinct fetal movements.

B. Perception of 10 distinct movements in a period of up to 2 hours is considered reassuring. After 10 movements have been perceived, the count may be discontinued.

C. If a reassuring count is not observed, a NST should be completed.

D. Maternal perception of a relative decrease in fetal activity, compared with the previous level, is an important factor.

E. Women at increased risk for antepartum fetal demise who are not

undergoing daily biophysical testing should be instructed in fetal activity assessment.

V. Clinical Application of Antepartum Tests

A. Indications

1. Biophysical antepartum tests of fetal well-being is a pregnancy at increased risk for antepartum fetal demise, including the following:

Decreased fetal movement	Systemic lupus erythematosus
Hypertensive disorders	Maternal cyanotic heart disease
Diabetes mellitus (insulin treated)	Hemoglobinopathies
Oligohydramnios	Previous unexplained fetal demise
Intrauterine growth retardation	Multiple gestation with significantly discordant growth
Postdate pregnancy (42 weeks or more)	Hyperthyroidism
Isoimmunization	
Chronic renal disease	

B. Choice of Test

1. Then NST is the test used most frequently. The CST is an earlier predictor of fetal compromise than the NST.

C. Timing of Antepartum Testing

1. With most at-risk pregnancies, testing usually begins by 32-34 weeks of gestation.

2. In pregnancies with particularly high-risk conditions, testing may begin as early as 26-28 weeks.

D. Frequency of Testing

1. When the clinical condition that has prompted testing persists, a reassuring test (reactive NST, negative CST, normal BPP) should be repeated (usually every 7 days) until delivery.

2. If significant clinical deterioration occurs (eg, worsening hypertension, ketoacidosis, or hemorrhage), reevaluation is indicated.

3. The testing interval may be more frequent (eg, daily) for women with some high-risk conditions (insulin-requiring diabetics, severe chronic hypertension, intrauterine growth retardation, Rh sensitization, and postterm).

4. A reactive NST with possible late decelerations requires more frequent NST's or CST, or the NST may be repeated the following day. An NST or CST tracing showing variable decelerations of at least 15 beats per minute for 15 seconds or longer in the presence of oligohydramnios indicates umbilical cord vulnerability. These results should be followed by further evaluation or delivery.

5. Prolonged (1 minute or more) and deep (below 90 beats per minute or 40 beats below baseline) decelerations are predictive of intrapartum distress, and delivery of the term fetus should be considered.

E. Follow-up

1. A nonreactive NST is usually followed by a CST. A positive CST result suggests that the NST nonreactivity is a consequence of hypoxia-induced acidosis.

2. Any suspicious or unsatisfactory CST, NST, or BPP should be repeated within 24 hours.
3. A positive CST or a BPP score of less than 4 usually indicates that delivery is warranted.

Brief Post Operative Cesarean Section Note

Pre-op diagnosis:

1. 23 year old G_1P_0, estimated gestational age = 40 weeks
2. Dystocia
3. Non-reassuring fetal tracing

Post-op diagnosis: Same as above
Procedure: Primary low segment transverse cesarean Section
Attending Surgeon, Assistant:
Anesthesia: Epidural
Operative Findings: Weight and sex of infant, APGARs at 1 min and 5 mins; normal uterus, tubes, ovaries.
Cord pH:
Specimens: Placenta, cord blood (type and Rh).
Estimated Blood Loss: 800 cc; no blood replaced.
Fluids, blood and urine output:
Drains: Foley to gravity.
Complications: None
Disposition: Patient sent to recovery room in stable condition.

Cesarean Section Operative Report

Preoperative Diagnosis:

1. 23 year old G_1P_0, estimated gestational age = 40 weeks
2. Dystocia
3. Non-reassuring fetal tracing

Postoperative Diagnosis: Same as above
Title of Operation: Primary low segment transverse cesarean section
Surgeon:
Assistant:
Anesthesia: Epidural
Findings At Surgery: Male infant in occiput posterior presentation. Thick meconium with none below the cords, pediatrics present at delivery, APGAR's 6/8, weight 3980 g. Normal uterus, tubes, and ovaries.
Description of Operative Procedure:

After assuring informed consent, the patient was taken to the operating room and spinal anesthesia was initiated. The patient was placed in the dorsal, supine position with left lateral tilt. The abdomen was prepped and draped in sterile fashion.

A Pfannenstiel skin incision was made with a scalpel, and carried through

to the level of the fascia. The fascial incision was extended bilaterally with Mayo scissors. The fascial incision was then grasped with the Kocher clamps, elevated, and sharply and bluntly dissected superiorly and inferiorly from the rectus muscles.

The rectus muscles were then separated in the midline, and the peritoneum was tented up, and entered sharply with Metzenbaum scissors. The peritoneal incision was extended superiorly and inferiorly with good visualization of the bladder.

A bladder blade was then inserted, and the vesicouterine peritoneum was identified, grasped with the pick-ups, and entered sharply with the Metzenbaum scissors. This incision was then extended laterally, and a bladder flap was created. The bladder was retracted using the bladder blade. The lower uterine segment was incised in a transverse fashion with the scalpel, then extended bilaterally with bandage scissors. The bladder blade was removed, and the infants head was delivered atraumatically. The nose and mouth were suctioned and the cord clamped and cut. The infant was handed off to the pediatrician. Cord gases and cord blood were sent.

The placenta was then removed manually, and the uterus was exteriorized, and cleared of all clots and debris. The uterine incision was repaired with 1-O chromic in a running locking fashion. A second layer of 1-O chromic was used to obtain excellent hemostasis. The bladder flap was repaired with a 3-O Vicryl in a running fashion. The cul-de-sac was cleared of clots and the uterus was returned to the abdomen. The peritoneum was closed with 3-0 Vicryl. The fascia was re-approximated with O Vicryl in a running fashion. The skin was closed with staples.

The patient tolerated the procedure well. Needle and sponge counts were correct times two. Two grams of Ancef was given at cord clamp, and a sterile dressing was placed over the incision.

Estimated Blood Loss (EBL): 800 cc; no blood replaced (normal blood loss is 500-1000 cc).

Specimens: Placenta, cord pH, cord blood specimens.

Drains: Foley to gravity.

Fluids: Input - 2000 cc LR; Output - 300 cc clear urine.

Complications: None.

Disposition: The patient was taken to the recovery room then postpartum ward in stable condition.

Post Operative Management after Cesarean-Section

I. Post Cesarean-Section Orders

- **A. Transfer:** to post partum ward when stable.
- **B. Vital signs:** q4h x 24 hours, I and O.
- **C. Activity:** Bed rest x 6-8 hours, then ambulate; if given spinal, keep patient flat on back x 8h. Incentive spirometer q1h while awake.
- **D. Diet:** NPO x 8h, then sips of water. Advance to clear liquids, then to

regular diet as tolerated.

E. IV Fluids: IV D5 LR or D5 1/2 NS at 125 cc/h. Foley to gravity; discontinue after 12 hours. I and O catheterize prn.

F. Medications

1. Cefazolin (Ancef) 1 gm IVPB x one dose at time of cesarean section.

2. Meperidine (Demerol) 50-75 mg IM q3-4h prn pain.

3. Hydroxyzine (Vistaril) 25-50 mg IM q3-4h prn nausea.

4. Prochlorperazine (Compazine) 10 mg IM q4-6h prn nausea **OR**

5. Promethazine (Phenergan) 25-50 mg IM/IV q3-4h prn nausea

G. Labs: CBC in AM.

II. Post-Operative Day #1

A. Assess pain, lungs, cardiac status, fundal height, lochia, passing of flatus, bowel movement, distension, tenderness, bowel sounds, incision.

B. Discontinue IV when taking adequate PO fluids.

C. Discontinue Foley, and I and O catheterize prn.

D. Ambulate tid with assistance; incentive spirometer q1h while awake.

E. Check hematocrit, hemoglobin, Rh, and rubella status.

F. Medications

1. Acetaminophen/codeine (Tylenol #3) 1-2 PO q4-6h prn pain.

2. FeSO4 325 mg PO bid-tid.

3. Multivitamin PO qd, Colace 100 mg PO bid. Mylicon 80 mg PO qid prn bloating.

III. Post-Operative Day #2

A. If passing gas and/or bowel movement, advance to regular diet.

B. Laxatives: Dulcolax supp prn, or Milk of magnesia 30 cc PO tid prn. Mylicon 80 mg PO qid prn bloating.

IV. Post-Operative Day #3

9. If transverse incision, remove staples and place steri-strips on day 3. If a vertical incision, remove staples on post op day 5.

10. Discharge home on appropriate medications; follow up in 2 and 6 weeks.

Laparoscopic Bilateral Tubal Ligation Operative Report

Preoperative Diagnosis: Multiparous female desiring permanent sterilization.
Postoperative Diagnosis: Same as above
Title of Operation: Laparoscopic bilateral tubal ligation with Falope rings
Surgeon:
Assistant:
Anesthesia: General endotracheal
Findings At Surgery: Normal uterus, tubes, and ovaries.
Description of Operative Procedure

After informed consent, the patient was taken to the operating room where general anesthesia was administered. The patient was examined under anesthesia and found to have a normal uterus with normal adnexa. She was

placed in the dorsal lithotomy position and prepped and draped in sterile fashion. A bivalve speculum was placed in the vagina, and the anterior lip of the cervix was grasped with a single toothed tenaculum. A uterine manipulator was placed into the endocervical canal and articulated with the tenaculum. The speculum was removed from the vagina.

An infraumbilical incision was made with a scalpel, then while tenting up on the abdomen, a Verres needle was admitted into the intra-abdominal cavity. A saline drop test was performed and noted to be within normal limits. Pneumoperitoneum was attained with 4 liters of carbon dioxide. The Verres needle was removed, and a 10 mm trocar and sleeve were advanced into the intra-abdominal cavity while tenting up on the abdomen. The laparoscope was inserted and proper location was confirmed. A second incision was made 2 cm above the symphysis pubis, and a 5 mm trocar and sleeve were inserted into the abdomen under laparoscopic visualization without complication.

A survey revealed normal pelvic and abdominal anatomy. A Falope ring applicator was advanced through the second trocar sleeve, and the left Fallopian tube was identified, followed out to the fimbriated end, and grasped 4 cm from the cornual region. The Falope ring was applied to a knuckle of tube and good blanching was noted at the site of application. No bleeding was observed from the mesosalpinx. The Falope ring applicator was reloaded, and a Falope ring was applied in a similar fashion to the opposite tube. Carbon dioxide was allowed to escape from the abdomen.

The instruments were removed, and the skin incisions were closed with #3-O Vicryl in a subcuticular fashion. The instruments were removed from the vagina, and excellent hemostasis was noted. The patient tolerated the procedure well, and sponge, lap and needle counts were correct times two. The patient was taken to the recovery room in stable condition.

Estimated Blood Loss (EBL): <10 cc
Specimens: None
Drains: Foley to gravity
Fluids: 1500 cc LR
Complications: None
Disposition: The patient was taken to the recovery room in stable condition.

Postpartum Tubal Ligation Operative Report

Preoperative Diagnosis: Multiparous female after vaginal delivery, desiring permanent sterilization.
Postoperative Diagnosis: Same as above
Title of Operation: Modified Pomeroy bilateral tubal ligation
Surgeon:
Assistant:
Anesthesia: Epidural
Findings At Surgery: Normal fallopian tubes bilaterally
Description of Operative Procedure:

After assuring informed consent, the patient was taken to the operating

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room and spinal anesthesia administered. A small, transverse, infraumbilical skin incision was made with the scalpel, and the incision was carried down through the underlying fascia until the peritoneum was identified and entered. The left fallopian tube was identified, brought into the incision and grasped with a Babcock clamp. The tube was then followed out to the fimbria. An avascular midsection of the fallopian tube was grasped with a Babcock clamp and brought into a knuckle. The tube was doubly ligated with an O-plain suture and transected. The specimen was sent to pathology. Excellent hemostasis was noted, and the tube was returned to the abdomen. The same procedure was performed on the opposite fallopian tube.

The fascia was then closed with O-Vicryl in a single layer. The skin was closed with 3-O Vicryl in a subcuticular fashion.

The patient tolerated the procedure well. Needle and sponge counts were correct times 2.

Estimated Blood Loss (EBL): <20 cc
Specimens: Segments of right and left tubes
Drains: Foley to gravity
Fluids: Input - 500 cc LR; output - 300 cc clear urine
Complications: None
Disposition: The patient was taken to the recovery room in stable condition.

Prevention of D Isoimmunization

The morbidity and mortality of Rh hemolytic disease can be significantly reduced by identification of women at risk for isoimmunization and by treatment of them with D immunoglobulin. Administration of D immunoglobulin [RhoGam, Rho(D) immunoglobulin, RhIg] is very effective in the preventing isoimmunization to the D antigen.

I. Prenatal Testing

A. Routine prenatal laboratory evaluation includes ABO and D blood type determination and antibody screen.

B. At 28-29 weeks of gestation woman who are D negative but not D isoimmunized should be retested for D antibody. If the test reveals that no D antibody is present, prophylactic D immunoglobulin [RhoGam, Rho(D) immunoglobulin, RhIg] is indicated. If D antibody is present, D immunoglobulin will not be beneficial, and specialized management of the D isoimmunized pregnancy is undertaken to manage hemolytic disease of the fetus and hydrops fetalis.

II. Routine Administration of D Immunoglobulin

A. Abortion. D sensitization may be caused by abortion. D sensitization occurs more frequently after induced abortion than after spontaneous abortion, and it occurs more frequently after late abortion than after early abortion. D sensitization occurs following induced abortion in 4-5% of susceptible women. All unsensitized, D-negative women who have an induced or spontaneous abortion should be treated with D immunoglobulin unless the father is known to be D negative.

B. The dosage of D immunoglobulin is determined by the stage of gestation. If the abortion occurs before 13 weeks of gestation, 50 mcg of D immunoglobulin prevents sensitization. For abortions occurring at 13 weeks of gestation and later, 300-mcg is given.

C. Ectopic pregnancy can cause D sensitization. All unsensitized, D-negative women who have an ectopic pregnancy should be given D immunoglobulin. The dosage is determined by the gestational age, as described above for abortion.

D. Amniocentesis

1. D isoimmunization can occur after amniocentesis. D immunoglobulin, 300 mcg, should be administered to unsensitized, D-negative, susceptible patients following first- and second-trimester amniocentesis. These patients then receive routine antepartum and postpartum prophylaxis.

2. Following third-trimester amniocentesis, 300 mcg of D immunoglobulin should be administered. If amniocentesis is performed and delivery is planned within 48 hours, D immunoglobulin can be withheld until after delivery, when the newborn can be tested for D positivity. If the amniocentesis is expected to precede delivery by more than 48 hours, the patient should receive 300 mcg of D immu-

noglobulin at the time of amniocentesis.

E. Antepartum Prophylaxis

1. One to two percent of D-negative women become isoimmunized during the antepartum period. D immunoglobulin, administered both during pregnancy and postpartum, can reduce the incidence of D isoimmunization to 0.3%.
2. Antepartum prophylaxis is given at 28-29 weeks of gestation. Antibody-negative, Rh-negative gravidas should have a repeat assessment at 28 weeks. D immunoglobulin (RhoGam, RhIg), 300 mcg, is given to D-negative women. However, if the father of the fetus is known with certainty to be D negative, antepartum prophylaxis is not necessary.

F. Postpartum D Immunoglobulin

1. D immunoglobulin is given to the D negative mother as soon after delivery as cord blood findings indicate that the baby is Rh positive.
2. A woman at risk who is inadvertently not given D immunoglobulin within 72 hours after delivery should still receive prophylaxis at any time up until two weeks after delivery. If prophylaxis is delayed, it may not be effective.
3. If there is any question about the amount of D immunoglobulin to be administered after delivery, a Kleihauer-Betke test should be performed in order to calculate the quantity of transplacental hemorrhage that has occurred. One vial (300 mcg) of D immunoglobulin should be administered if the transplacental hemorrhage is 25 mL of blood or less, and two vials (600 mcg) are given if the transplacental hemorrhage is between 25 and 50 mL. The 300-mcg vial of D immunoglobulin protects against approximately 30 mL of fetal blood in the maternal circulation.

III. Special Considerations

A. Abruptio placentae, placenta previa, cesarean delivery, intrauterine manipulation, or manual removal of the placenta may cause more than 30 mL of fetal-to-maternal bleeding. In these conditions, testing for excessive bleeding (Kleihauer-Betke test) or inadequate D immunoglobulin dosage (indirect Coombs test) is necessary.

Spontaneous Abortion

Abortion is defined as termination of pregnancy resulting in expulsion of an immature, nonviable fetus. A fetus of <20 weeks gestation or a fetus weighing <500 gm is considered an abortus. Spontaneous abortion occurs in 15% of all pregnancies.

I. Threatened Abortion is defined as vaginal bleeding occurring in the first 20 weeks of pregnancy, without the passage of tissue or rupture of membranes.

A. Symptoms of pregnancy (nausea, vomiting, fatigue, breast tenderness, urinary frequency) may be present.

B. Speculum exam reveals blood coming from the cervical os without amniotic fluid or tissue in the endocervical canal.

C. The internal cervical os is closed, and the uterus is soft and enlarged appropriate for gestational age.

D. Differential Diagnosis

1. **Benign and Malignant Lesions.** The cervix often bleeds from an ectropion of friable tissue. Hemostasis can be accomplished by applying pressure for several minutes with a large swab or by cautery with a silver nitrate stick. Atypical cervical lesions should be evaluated with colposcopy and biopsy.
2. **Disorders of Pregnancy**
   a. **Hydatidiform mole** may present with early pregnancy bleeding, passage of grape-like vesicles, and a uterus that is enlarged in excess of that expected from dates. An absence of a heart tones by Doppler after 12 weeks is characteristic. Hyperemesis, preeclampsia, or hyperthyroidism may be present. Ultrasonography confirms the diagnosis.
   b. **Ectopic pregnancy** should be excluded when first trimester bleeding is associated with pelvic pain. Orthostatic light-headedness, syncope or shoulder pain from diaphragmatic irritation may occur.
      (1) Abdominal tenderness is noted, and pelvic examination reveals cervical motion tenderness.
      (2) Serum beta-HCG is positive, but the urine pregnancy test is positive in only 50%.

E. Laboratory Tests

1. Complete blood count. The CBC will not reflect acute blood loss.
2. Quantitative serum beta-HCG level. Beta-HCG may be positive in nonviable gestations since beta-HCG may persist in the serum for several weeks after fetal death.
3. **Ultrasonography** should detect fetal heart motion by 7 weeks gestation or older. Failure to detect fetal heart motion after 9 weeks gestation should prompt consideration of curettage.

F. Treatment of Threatened Abortion

1. Bed rest with sedation and abstinence from intercourse.
2. The patient should report increased bleeding (>normal menses), cramping, passage of tissue, or fever. Passed tissue should be saved for examination.

II. Inevitable Abortion is defined as a threatened abortion with a dilated cervical os. Menstrual-like cramps usually occur.

A. Differential Diagnosis

1. **Incomplete abortion** is diagnosed when tissue has passed. Tissue may be visible in the vagina or endocervical canal.
2. **Threatened abortion** is diagnosed when the internal os is closed and will not admit a fingertip.
3. **Incompetent cervix** is characterized by dilatation of the cervix without cramps.

B. Treatment of Inevitable Abortion

1. Surgical evacuation of the uterus is necessary.
2. D immunoglobulin (RhoGAM) is administered to Rh-negative, unsensitized patients to prevent isoimmunization. Before 13 weeks gestation, the dosage is 50 mcg IM; at 13 weeks gestation, the dosage is 300 mcg IM.

III. Incomplete Abortion is characterized by cramping, bleeding, passage of tissue, and a dilated internal os with tissue present in the vagina or endocervical canal. Profuse bleeding, orthostatic dizziness, syncope, and postural pulse and blood pressure changes may occur.

A. Laboratory Evaluation

1. Complete blood count. CBC will not reflect acute blood loss.
2. Rh typing
3. Blood typing and cress-matching.
4. Karyotyping of products of conception is completed if loss is recurrent.

B. Treatment

1. **Stabilization.** If the patient has signs and symptoms of heavy bleeding, at least 2 large-bore IV catheters ($\geq$16 gauge) are placed. Lactate Ringer's or normal saline with 40 U oxytocin/L is given IV at 200 mL/hour or greater.
2. Products of conception are removed from the endocervical canal and uterus with a ring forceps. Immediate removal decreases bleeding. Curettage is performed after vital signs have stabilized.
3. **Suction Dilation and Curettage**
   - **a.** Analgesia consists of meperidine (Demerol), 35-50 mg IV over 3-5 minutes until the patient is drowsy.
   - **b.** The patient is placed in the dorsal lithotomy position in stirrups, prepared, draped, and sedated.
   - **c.** A weighted speculum is placed intravaginally, the vagina and cervix are cleansed, and a paracervical block is placed.
   - **d.** Bimanual examination confirms the position and size of the uterus. Uterine sounding confirms the direction of the endocervical canal.
   - **e.** Mechanical dilatation is completed with Hegar or Pratt dilators if necessary. Curettage is performed with an 8 mm suction curette, with a single-tooth tenaculum or a ring forceps on the anterior lip of the cervix for counteraction.
4. **Post-curettage.** After curettage, a blood count is ordered. If the vital signs are stable for several hours, the patient is discharged with instructions to avoid coitus, douching, or the use of tampons for 2 weeks. Oral ferrous sulfate and ibuprofen are prescribed.
5. Rh-negative, unsensitized patients are given IM RhoGAM.
6. Methylergonovine, 0.2 mg PO q4h for 6 doses, is given if there is continued moderate bleeding.

IV. Complete Abortion

A. A complete abortion is diagnosed when complete passage of products of conception has occurred. The uterus is well contracted, and the cervical os may be closed.

B. Differential Diagnosis

1. Incomplete abortion
2. Ectopic pregnancy. Products of conception should be examined grossly and submitted for pathologic examination. If no fetal tissue or villi are observed grossly, ectopic pregnancy must be excluded by ultrasound.

C. Management of Complete Abortion

1. Between 8 and 14 weeks, curettage is necessary because of the high probability that the abortion was incomplete. Before 8 weeks or after 14 weeks, the patient may be observed as an outpatient.
2. D immunoglobulin (RhoGAM) is administered to Rh-negative, unsensitized patients.
3. Beta-HCG levels are obtained weekly until zero.
4. Incomplete abortion is suspected if beta-HCG levels plateau or fail to reach zero within 4 weeks.

V. Missed Abortion is diagnosed when products of conception are retained after the fetus has expired. If products are retained, a severe coagulopathy with bleeding often occurs.

A. Missed abortion should be suspected when the pregnant uterus fails to grow as expected or when fetal heart tones disappear.

B. Amenorrhea may persist, or intermittent vaginal bleeding, spotting, or brown discharge may be noted.

C. Ultrasonography confirms the diagnosis.

D. Management of Missed Abortion

1. **Laboratory Evaluation**. CBC with platelet count, fibrinogen level, partial thromboplastin time, and ABO blood typing and antibody screen.
2. **Evacuation** of the uterus is completed after fetal death has been confirmed. Dilation and evacuation by suction curettage is appropriate when the uterus is less than 12-14 weeks gestational size.
3. **D Immunoglobulin (RhoGAM)** is administered to Rh-negative unsensitized patients.

Antepartum Urinary Tract Infection

Four to seven percent of pregnant women will develop asymptomatic bacteriuria, and 1-2% will develop symptomatic cystitis with dysuria and frequency. Pyelonephritis develops in 25-30% of women with untreated bacteriuria.

I. Asymptomatic bacteriuria is diagnosed by prenatal urine culture screening, and it is defined as a colony count $\geq 10^5$ organisms per milliliter. Patients with symptomatic cystitis should be treated immediately with oral antibiotics.

A. Antibiotic therapy

1. Cystitis or asymptomatic bacteriuria is treated for 7 days. A repeat culture is completed after therapy.
2. Nitrofurantoin monohydrate (Macrobid) 100 mg PO bid **OR**

3. Nitrofurantoin (Macrodantin) 100 mg PO qid **OR**
4. Amoxicillin 250-500 mg PO tid **OR**
5. Trimethoprim/sulfamethoxazole DS (Bactrim DS) 1 tab PO bid **OR**
6. Sulfisoxazole (Gantrisin) 2 gm, then 1 gm PO qid **OR**
7. Cephalexin (Keflex) 250-500 mg PO qid.

II. Pyelonephritis

A. In pregnancy, pyelonephritis can progress rapidly to septic shock, and it may cause preterm labor. Upper tract urinary infections are associated with an increased incidence of fetal prematurity. Pyelonephritis is characterized by fever, chills, nausea, uterine contractions, and dysuria.

B. Physical exam reveals fever, and costovertebral angle tenderness.

C. The most common pathogens are Escherichia coli and Klebsiella pneumoniae.

D. Patients should be hospitalized for intravenous antibiotics and fluids.

E. Pyelonephritis is treated with an intravenous antibiotic regimen to which the infectious organism is sensitive for at least 7 days.

F. Ampicillin 1 gm IVPB q4-6h **AND**

G. Gentamicin 2 mg/kg IVPB then 1.5 mg/kg IV q8h **OR**

H. Cefazolin (Ancef) 1-2 gm IVPB q8h **OR**

I. Ampicillin/sulbactam (Unasyn) 1.5-3 gm IVPB q6h.

J. Bedrest in the semi Fowler's position on the side opposite affected kidney may help to relieve the pain. Patients with continued fever and pain for more than 48 to 72 hours, may have a resistant organism, obstruction, perinephric abscess, or an infected calculus or cyst.

K. **Oral antibiotics** are initiated once fever and pain have resolved for at least 24 hours.

1. **Nitrofurantoin monohydrate (Macrobid)** 100 mg PO bid x 7-10 days, then 100 mg PO qhs **OR**
2. **Nitrofurantoin (Macrodantin)** 100 mg PO qid x 7-10 days, then 100 mg PO qhs **OR**
3. **Cephalexin (Keflex)** 500 mg PO qid x 7-10 days.
   - **a.** Amoxicillin, 250 mg tid; sulfisoxazole, 500 mg qid; nitrofurantoin, 100 mg qid; and cephalexin, 500 mg qid.
   - **b.** **Contraindicated Antibiotics.** Sulfonamides should not be used within four weeks of delivery because kernicterus is a theoretical risk. Aminoglycosides should be used for only short periods because of fetal ototoxicity and nephrotoxicity. Tetracyclines cause fetal bone and teeth abnormalities.
   - **c.** Nitrofurantoin and sulfonamides may cause hemolysis in patients with glucose 6-phosphate dehydrogenase deficiency.
   - **d.** After successful therapy, cultures are rechecked monthly during pregnancy, and subsequent infections are treated. Antibiotic prophylaxis is recommended for women with two or more bladder infections or one episode of pyelonephritis during pregnancy. Reinfection is treated for 10 days, then low dose prophylaxis is initiated until 2 weeks postpartum.
   - **e.** Prophylactic therapy includes nitrofurantoin (Macrodantin), 100 mg at bedtime or sulfisoxazole (Gantrisin) 0.5 gm bid.

Trauma During Pregnancy

Trauma is the leading cause of nonobstetric death in women of reproductive age. Six percent of all pregnancies are complicated by some type of trauma.

I. Mechanism of Injury

A. Blunt Abdominal Trauma

1. Blunt abdominal trauma secondary to motor vehicle accidents is the leading cause of nonobstetric-related fetal death during pregnancy, followed by falls and assaults.
2. Uterine rupture or laceration, retroperitoneal hemorrhage, renal injury and upper abdominal injuries are possible.
3. Abruptio placentae occurs in 40-50% of patients with major traumatic injuries and in up to 5% of patients with minor injuries.
4. **Clinical Findings in Blunt Abdominal Trauma.** Vaginal bleeding, uterine tenderness, uterine contractions, fetal tachycardia, late decelerations, fetal acidosis, and fetal death.
5. **Detection of Abruptio Placentae**. Beyond 20 weeks of gestation, external electronic monitoring can detect uterine contractile activity. The presence of vaginal bleeding and tetanic or hypertonic contractions is presumptive evidence of abruptio placentae.
6. **Uterine Rupture**
   a. Uterine rupture is an infrequent but life-threatening complication. It usually occurs after a direct abdominal impact.
   b. Findings of uterine rupture range from subtle (uterine tenderness, nonreassuring fetal heart rate pattern) to severe, with rapid onset of maternal hypovolemic shock and death.
7. **Direct Fetal Injury** is an infrequent complication of blunt trauma.
   a. The fetus is more frequently injured as a result of hypoxia from blood loss or abruption.
   b. In the first trimester the uterus is not an abdominal organ; therefore, minor trauma usually does not cause miscarriage in the first trimester.

B. Penetrating Trauma

1. Penetrating abdominal trauma from gunshot and stab wounds during pregnancy has a poor prognosis.
2. Perinatal mortality is 41-71%. Maternal mortality is less than 5%.

II. Minor Trauma in Pregnancy

A. Clinical Evaluation

1. Pregnant patients who sustain seemingly minimal trauma require an evaluation to exclude significant injuries. Common "minor" trauma includes falls, especially in the third trimester, blows to the abdomen, or "fender benders" motor vehicle accidents.
2. The patient should be questioned about seat belt use, loss of consciousness, pain, vaginal bleeding, rupture of membranes, and fetal

movement.

3. **Physical Exam**
   a. Physical examination should focus on upper abdominal tenderness (liver or spleen damage), flank pain (renal trauma), uterine pain (placental abruption, uterine rupture), and pain over the symphysis pubis (pelvic fracture, bladder laceration, fetal skull fracture).
   b. A search for orthopedic injuries is completed.

B. Management of Minor Trauma

1. The minor trauma patient with a fetus that is less than 20 weeks gestation (not yet viable), with no significant injury can be safely discharged after documentation of fetal heart rate. Patients with potentially viable fetuses (over 20 weeks of gestation) require fetal monitoring, laboratory tests and ultrasonographic evaluation.
2. A complete blood count, urinalysis (hematuria), blood type and screen (to check Rh status), and coagulation panel, including measurement of the INR, PTT, fibrinogen and fibrin split products, should be obtained. The coagulation panel is useful if any suspicion of abruption exists.
3. **The Kleihauer-Betke (KB) Test**
   a. This test detects fetal red blood cells in the maternal circulation. A KB stain should be obtained routinely for any pregnant trauma patient whose fetus is over 12 weeks (when the uterus becomes an abdominal organ).
   b. Regardless of the patient's blood type and Rh status, the KB test can help determine if fetomaternal hemorrhage has occurred.
   c. The KB test can also be used to determine the amount of Rho(D) immunoglobulin (RhoGAM) required in patients who are Rh-negative.
   d. A positive KB stain indicates uterine trauma, and any patient with a positive KB stain should receive at least 24 hours of continuous uterine and fetal monitoring and a coagulation panel.
4. **Ultrasonography** is less sensitive for diagnosing abruption than is the finding of uterine contractions on external tocodynamometry. Absence of sonographic evidence of abruption does not completely exclude an abruption.
5. Patients with abdominal pain, significant bruising, vaginal bleeding, rupture of membranes, or uterine contractions should be admitted to the hospital for overnight observation and continuous fetal monitoring.
6. Uterine contractions and vaginal bleeding are suggestive of abruption. Even if vaginal bleeding is absent, the presence of contractions is still a concern, since the uterus can contain up to 2 L of blood from a concealed abruption.
7. Trauma patients with no uterine contraction activity, usually do not have abruption, while patients with greater than one contraction per 10 minutes (6 per hour) have a 20% incidence of abruption.
8. In minor trauma patients with minimal trauma and no uterine contractions, no rupture of membranes and no bleeding or pain, 4-6 hours of monitoring is usually adequate. Patients without contractions or

bleeding who have been monitored for 4-6 hours and who are being discharged should be advised to return if contractions increase, or if vaginal bleeding, or abdominal pain develops.

9. **Management of Preterm Labor After Minor Trauma**
   - **a.** If no cervical change is apparent, tocolytic therapy is usually unnecessary.
   - **b.** If documented preterm labor exists and the gestational age of the fetus suggests possible pulmonary immaturity, tocolysis with magnesium sulfate should be considered.

III. Major Trauma in Pregnancy

- **A.** Initial evaluation of major abdominal trauma in pregnant patients does not differ from evaluation of abdominal trauma in a nonpregnant patient.
- **B. Maintain airway**, ensuring adequate breathing and circulatory volume. Two large-bore (14-16-gauge) intravenous lines are placed.
- **C. Oxygen** should be administered by mask or endotracheal intubation. Maternal oxygen saturation should be kept at >90% (an oxygen partial pressure [pO_2] of 60 mm Hg).
- **D. Volume Resuscitation**
  1. Crystalloid in the form of lactated Ringer's or normal saline should be given as a 3:1 replacement for the estimated blood loss over the first 30-60 minutes of acute resuscitation.
  2. O-negative packed red cells are preferred if emergent blood is needed before the patient's own blood type is known.
  3. A urinary catheter should be placed to measure urine output and observe for hematuria.
- **E. Deflection of the uterus** off the inferior vena cava and abdominal aorta can be achieved by placing the patient in the lateral decubitus position. If the patient must remain supine, manual deflection of the uterus to the left with a hand and placement of a wedge under the patient's hip or backboard will tilt the patient.
- **F. Secondary Survey.** Following stabilization, a more detailed secondary survey of the patient, including fetal evaluation, is performed.
- **G.** Pregnancy should not substantially alter treatment of nonobstetric-related injuries, and radiography is not contraindicated in trauma patients who are pregnant.

Thromboembolic Disease in Pregnancy

Thromboembolic disease is the leading non-obstetrical cause of maternal mortality with an incidence of 0.05-0.3%. Early recognition and proper treatment can dramatically improve outcome.

I. Incidence and Pathophysiology

- **A.** The incidences of antepartum and postpartum thromboembolism are equal in frequency.
- **B.** Although thrombophlebitis can be seen at any stage of gestation, it

appears to increase in frequency as pregnancy advances.

C. After delivery, deep vein thrombosis is most frequently seen on the second postpartum day. It may occur up to 4 weeks after delivery.

1. Untreated, 24% of patients with antenatal DVT will have a pulmonary embolism, with a mortality rate of 15%.
2. If treated with anticoagulants, embolization will occur in only 4.5%, and the mortality rate is less than 1%.

D. In the third trimester the velocity of venous flow in the lower extremities is reduced by half because the gravid uterus impedes venous return.

1. This tendency toward stasis is augmented if the patient requires periods of prolonged bed rest as in preeclampsia, threatened abortion, or premature labor.
2. Fibrinogen, factor VIII, and other vitamin-K-dependent clotting factors are increased during pregnancy.

E. The risk of thrombosis is enhanced by cesarean section (a nine-fold increase over vaginal delivery), instrument delivery, advanced maternal age, and increased parity.

F. Other Risk Factors for Thromboembolic Disease

1. History of prior thromboembolism
2. Trauma or infection
3. Obesity
4. Congestive heart failure
5. Dehydration, shock
6. Disseminated cancer
7. Dysproteinemia
8. Polycythemia vera
9. Anemia (especially sickle cell)
10. Thrombocythemia

G. Overall, the risk during pregnancy and postpartum is 5.5 times greater than that for nonpregnant controls.

H. The recurrence risk for women with a prior episode of TED is 12%.

II. Diagnosis

A. Deep Venous Thrombosis

1. **Signs and Symptoms of Deep Venous Thrombosis.** Muscle pain, tenderness, swelling, positive Homan's sign
2. None of these symptoms or signs are specific.
3. Clots are sometimes found in a totally asymptomatic limb.
4. **Impedance Plethysmography and Doppler Ultrasound**
   - **a.** Excellent for evaluating popliteal and proximal veins (sensitivity 91 and specificity 99%).
   - **b.** Serial measurements are necessary to rule out propagation of a clot in the calf.
5. **Venography** has been the reference standard against which all other methods are compared.
   - **a.** It is invasive, expensive, and difficult to interpret unless all of the deep veins are filled adequately; the contrast material may cause chemical phlebitis.
   - **b.** Venography is most useful in determining whether or not to

initiate therapy when other study results are equivocal.

B. Pulmonary Embolism

1. Clinical Signs and Symptoms

a. The hallmark of pulmonary embolism is dyspnea.

b. The major sign is tachypnea.

Signs and Symptoms of Pulmonary Embolism

Tachypnea	89%
Dyspnea	81%
Pleuritic pain	72%
Apprehension	59%
Cough	54%
Tachycardia	43%
Hemoptysis	34%
Temperature >37° C	34%

2. Massive pulmonary embolism may present with signs suggesting a myocardial infarction, including hypotension, syncope, convulsions, tachycardia, or rales.

3. Massive emboli may produce right-sided heart failure with jugular venous distention, an enlarged liver, a left parasternal heave, and fixed splitting of the second heart sound.

4. Electrocardiogram

a. The ECG is abnormal in 90% of patients; tachycardia alone is the most common abnormality. Nonspecific T-wave inversion is found in 40 %.

b. The classic right axis shift with strain pattern is found in patients with extensive embolization.

5. Arterial pO_2

a. An arterial partial pressure of O_2 (pAO_2) of greater than 80 mm Hg on breathing room air makes pulmonary embolism unlikely. However, 11.5% of patients with proven pulmonary embolism will have a pAO_2 of between 80 and 90 mm Hg.

b. A level of >90 mm Hg essentially excludes a pulmonary embolism.

6. Technetium Lung Scanning. The lung scan is coupled with a ventilation study. Ventilation-perfusion defects are diagnostic of pulmonary embolism.

III. Management of Thromboembolic Disease

A. Deep Venous Thrombosis

1. Heparin is administered as below.

2. Bed rest in Trendelenburg position with elevation of the involved extremity is valuable initially as it promotes venous return.
3. As soon as symptoms permit, the patient should be encourage to ambulate. Sitting with legs dependent is contraindicated. Application of moist heat reduces pain, and elastic stockings increase the velocity of venous flow.
4. Symptomatic treatment alone is satisfactory for DVT proven to be below the popliteal fossa and for superficial thrombophlebitis.

B. Pulmonary Embolism

1. Heparin is administered as below.
2. Oxygen therapy is particularly important during pregnancy; maternal pAO_2 should be maintained above 70 mm Hg.
3. Meperidine or morphine may be used for pain.
4. **Hypotension**
   a. Isoproterenol drip (1 mg in 500 mL of normal saline) is given at 2-8 mcg/min, or
   b. Dopamine (200 mg in 500 mL of normal saline) is started at 200 mcg/min
   c. Fluid administration should be monitored with a central venous pressure or pulmonary artery line.

C. Anticoagulation

1. **Heparin** is used primarily to prevent propagation of venous thromboembolism. Heparin will not stimulate fibrinolysis or directly lyse thrombi.
   a. Because of its large size and negative charge it does not cross the placenta or appear in breast milk.
   b. Heparin effects can be reversed rapidly with protamine sulfate; twice the amount necessary to neutralize the hourly dose is sufficient.
2. **Dosage**
   a. Optimal anticoagulation consists of a PTT, 1.5-2.5 x control (60 to 80 secs). Spontaneous hemorrhage will occur if the PTT exceeds 135 secs. The half-life of heparin is 1.5 hours.
   b. Before starting heparin obtain PTT, INR, CBC, platelet count, and urinalysis. Heparin should not be used if the platelet count is $<50 \times 10^9$/L
   c. **Initial Loading Dose**
      (1) 150 U/kg for pulmonary embolism
      (2) 100 U/kg for DVT (minimum 5,000 U)
   d. **Infusion rate:** 15-25 U/kg/hr.
3. Continuous intravenous heparin should be maintained for 3 to 5 days for active thromboembolic disease, or until symptoms have resolved and there is no evidence of recurrence. At this point the patient may be switched to subcutaneous heparin or oral coumarin (post-partum) if long-term management is indicated. If warfarin is to be used, it should be started as soon as possible
   a. Treat an acute first episode of thrombophlebitis during pregnancy for 3 to 4 months and institute prophylaxis during the

remainder of pregnancy, labor and delivery, and for 6 weeks postpartum.

b. If pulmonary embolization had occurred, therapy would be extended to six months.

4. Adjusted Dose Heparin

a. The total daily dose used intravenously is divided into 2 or 3 doses and administered every 8 or 12 hours. The dose adjusted to achieve an aPTT 1 1/2 times control at 6 hours.

b. This regimen is as effective as full dose warfarin (Coumadin) in preventing recurrence of thromboembolic disease.

5. Mini-dose Heparin

a. Heparin in may be used prophylactically in "mini-doses" to prevent thromboembolism; 5,000 U subcutaneously every 12 hours.

Anticoagulation Regimens

Clinical Situation	Anticoagulation Regimen
Superficial Thrombophlebitis	None
DVT/Pulmonary Embolism (current pregnancy)	Therapeutic until 6-12 weeks postpartum
DVT (prior pregnancy)	Prophylactic beginning in early pregnancy
Pulmonary Embolism (prior pregnancy)	Prophylactic or therapeutic

6. Contraindications to Heparin

a. Threatened abortion, significant risk of intracranial hemorrhage (eg, eclampsia, severe hypertension)

b. Hemoptysis from pulmonary infarction is not a contraindication

D. Warfarin (Coumadin)

1. Warfarin easily crosses the placenta and is excreted in breast milk

2. First trimester exposure causes multiple congenital anomalies including nasal cartilage hypoplasia, stippling of bones, intrauterine growth retardation, and brachydactyly. Warfarin may cause birth defects even if first administered in the second and third trimesters.

3. Administration during the last 2 trimesters may cause fetal and placental hemorrhage resulting in fetal demise.

4. Coumadin is usually contraindicated during pregnancy.

5. Initial dose is 10 to 15 mg daily, titrated to an INR of 2.0-3.0; the maintenance dose ranges from 3-20 mg daily. After stabilization, INR is checked once or twice weekly

6. Heparin is continued after initiating warfarin because heparin can

temporarily prolong the INR, the INR should be therapeutic before heparin is discontinued.

Diabetes in Pregnancy

Diabetes is the most common medical complication of pregnancy. Gestational diabetes mellitus is defined as glucose intolerance or diabetes diagnosed for the first time during pregnancy. Diabetes occurs in about 1-3% of all pregnancies. 90% of these cases represent gestational diabetes mellitus (GDM).

I. Classification

A. Pregestational diabetes is diabetes that is present prior to pregnancy, and it is classified as either type I (insulin-dependent) or type II (non-insulin-dependent).

B. Gestational diabetes is carbohydrate intolerance first recognized during pregnancy.

II. Pregestational Diabetes

A. There is a fourfold increase in the incidence of major congenital malformations in the offspring of women with pregestational diabetes that is poorly controlled during embryogenesis. A significant reduction in the fetal malformation rate occurs in women whose diabetes is tightly controlled during the period of organogenesis.

B. Pregnancy has been associated with a twofold risk for the progression of maternal diabetic retinopathy. Proliferative retinopathy may lead to vision loss if untreated and thus it should be monitored and managed with photocoagulation.

C. Diabetic women should be evaluated before pregnancy by means of a history, physical examination, ophthalmologic evaluation, and 24-hour urine collection for creatinine clearance and protein excretion. If this evaluation has not been accomplished before pregnancy, it should be done as early in pregnancy as possible.

D. Measurement of glycosylated hemoglobin (hemoglobin A1c) is used to assess prior diabetic control.

III. Complications of Gestational Diabetes in the Newborn

A. Macrosomia, hypocalcemia, hyperbilirubinemia, fetal hypoglycemia, respiratory distress, and congenital anomalies, such as caudal regression, spina bifida, anencephalus, and heart and renal anomalies are complications.

B. The risk of complications is significantly reduced when optimal control of glucose levels is maintained.

IV. Metabolic Control of Pregestational Diabetes

A. Maternal hyperglycemia leads to fetal hyperglycemia and fetal hyperinsulinemia, which may cause fetal macrosomia, fetal death and delayed pulmonary maturation.

B. Diabetic women should attempt to achieve and maintain euglycemia throughout pregnancy.

C. Glucose levels are recorded by the patient with a portable glucose meter, fasting and before each meal.

D. Therapeutic Objectives in Pregnancies Complicated by Diabetes Mellitus

1. **Fasting:** 60-90 mg/dL
2. **Before lunch, dinner, or bedtime snack:** 60-105 mg/dL
3. **After meals:** (1 hour) <130-140 mg/dL; (2 hours) <120 mg/dL
4. **From 2 AM to 6 AM:** 60-90 mg/dL

E. The average caloric intake should range from 2,200 to 2,400 kcal, with protein accounting for 12-20% of total energy intake, carbohydrate for 50-60%, and fat making up the remainder.

F. Insulin Therapy

1. Control of maternal glycemia usually can be achieved with multiple daily injections of insulin and adjustment of dietary intake. Oral hypoglycemic agents are not used during pregnancy because they reach the fetus and produce fetal hyperinsulinemia.
2. Most patients require a combination of both intermediate-acting and short-acting (regular) human insulin in the morning and evening. An alternative regimen for the evening is to administer separate injections of short-acting insulin at dinnertime and intermediate-acting insulin at bedtime to reduce the frequency of nocturnal hypoglycemia.

G. Fetal Evaluation

1. A maternal serum alpha-fetoprotein level is obtained at 16-20 weeks gestation and an ultrasound study is completed at 18-20 weeks in an attempt to detect neural tube defects and other anomalies.
2. **Antepartum Fetal Surveillance**
   - **a.** Fetal surveillance is initiated during the third trimester, and maternal monitoring of fetal activity (kick counts) is used as an adjunct to antepartum testing.
   - **b.** In complicated pregnancies, nonstress testing, biophysical profiles, or contraction stress testing may be initiated at 28 weeks.
   - **c.** Testing may be started considerably later in gestation for patients whose condition has been well controlled and whose fetus demonstrates normal growth on ultrasound examinations.

H. Delivery Considerations

1. **Timing of Delivery**
   - **a.** Patients who have maintained excellent glycemic control with normal fetal surveillance, may await the spontaneous onset of labor.
   - **b.** For highest risk patients with vascular disease, poor metabolic control, problems with compliance, or a previous stillbirth, the timing of delivery is based on documentation of pulmonary maturity.
   - **c.** Significant maternal hypertension, fetal growth delay, or worsening retinopathy may require preterm delivery.
   - **d.** Patients with poor or undocumented metabolic control or those at less than 39 weeks of gestation by accurate gestational dating should undergo amniocentesis to document fetal pulmonary

maturity.

(1) With a mature L/S ratio, a low incidence of respiratory distress syndrome can be expected. If the L/S ratio does not confirm lung maturity, delivery may be postponed and a repeat amniocentesis planned.

(2) When antepartum testing is nonreassuring and tests indicate lung maturity, the fetus should be delivered.

e. If premature labor occurs, tocolytic therapy with beta-sympathomimetic agents is avoided because they may significantly worsen maternal glucose control. Magnesium sulfate is the preferred IV tocolytic for women with diabetes mellitus.

I. Insulin Therapy During Labor

1. In patients with well-controlled diabetes who are scheduled for elective induction of labor, the usual dose of insulin is given at bedtime, and morning insulin is withheld.

2. Once active labor begins, a constant infusion of dextrose is given to supply caloric needs.

3. Short-acting insulin is added if the patient becomes hyperglycemic.

4. Capillary glucose values are determined every 1-2 hours.

Low-dosage Constant Insulin Infusion for the Intrapartum Period

Blood Glucose (mg/100 mL)	Insulin Dosage (U/h)	Fluids (125 mL/h)
< 100	0	Dextrose/Lactated Ringer's solution
100-140	1.0	Dextrose/Lactated Ringer's solution
141-180	1.5	Normal saline
181-220	2.0	Normal saline
>220	2.5	Normal saline

Dilution is 25 U of regular insulin in 250 mL of normal saline with 25 mL flushed through line, administered intravenously.

J. Elective Cesarean delivery

1. Cesarean delivery should be performed if the estimated weight is greater than 4,500 g.

2. Insulin Therapy for Cesarean Delivery

a. Elective cesarean delivery is scheduled for early morning. The usual morning insulin dose is withheld, and glucose levels are monitored frequently. Regular insulin is given if necessary.

b. After delivery, intravenous dextrose is given, and glucose levels are checked every 4-6 hours.

c. In the postpartum period, short-acting insulin is administered if glucose level rises above 200 mg/dL.

d. Once the patient begins a regular diet, subcutaneous insulin can be reinstituted at dosages substantially lower than those given in the third trimester. It is helpful if the pregestational dose is known.

V. Management of Gestational Diabetes

A. Proper Nutrition. Initial diet should contain 35 kcal/kg of ideal body weight. American Diabetic Association guidelines are observed.

B. Fasting should be avoided, and meals and snacks should be spaced evenly throughout the day. An increased amount of fiber may help control postprandial glucose elevations and minimize constipation.

C. Pharmacologic Interventions

1. Pharmacologic intervention is required when dietary management does not maintain the fasting plasma glucose at less than 105 mg/dL or the 2-hour postprandial plasma glucose at less than 120 mg/dL.

2. In women with well-controlled gestational diabetes, weekly biophysical fetal testing is initiated as early as 34 weeks of gestation. More intensive biophysical fetal testing is recommended in patients who require insulin, with hypertension, or with a history of previous stillbirth.

3. Initial insulin regimen consists of a bedtime dose of intermediate-acting NPH insulin, 0.15 U/kg of ideal body weight or 0.1 U/kg of actual body weight. Titration of the dose depends on patient response.

4. Multidose regular insulin is added before meals, or a morning dose of NPH may be mixed with regular insulin. Regular and NPH insulin before breakfast, regular insulin before supper, and NPH insulin at bedtime (regular insulin may be added as necessary) is commonly used.

Target Glucose Levels for Gestational Diabetes

Time of measurement	Glucose level (mg/dL)
Before breakfast	60-90
Before meals	60-105
2 hr postprandial	<120
02:00-08:00 clock time	>60

5. Fasting, pre-meal, and selected two-hour post-meal levels should be checked daily. The patient should be able to adjust her insulin dosage according to an algorithm established by the physician. Measurement of hemoglobin-A1c, every 4 to 6 weeks allows additional monitoring.

VI. Screening and Diagnosis of Gestational Diabetes

A. Glucose Challenge Testing. Screening for gestational diabetes mellitus is performed with a 50-g oral glucose load, followed by a venipuncture

glucose determination 1 hour later.

1. Screening is performed between 24 and 28 weeks of gestation.
2. Plasma glucose in excess of 140 mg/dL is positive and strongly suggests gestational diabetes; these patients should next be evaluated by a 3-hour oral glucose tolerance test.
3. Women who are at high risk for gestational diabetes need earlier intervention:
   a. Obese or overweight women
   b. Family history of diabetes
   c. Prior miscarriages or stillbirths without a specific reason
   d. Prior macrosomia of 9 lb or more
   e. Gestational diabetes in a previous pregnancy
   f. Hypertension and/or hyperlipidemia
   g. Prior baby with anomalies
   h. 30 years old or more.
4. Testing in these patients is done during the first visit. However, testing should be done immediately if a patient has symptoms or signs suggestive of diabetes (polyuria, nocturia, polydipsia, recurrent vaginal infections), or failure to gain expected weight.

B. Three-hour Oral Glucose Tolerance Test

1. Patients with a positive 50-g glucose challenge, are evaluated with a 3-hour glucose tolerance test.
2. Test is done in the morning, after an overnight fast.
3. After the specimen is drawn to determine fasting glucose level, the patient is given 100 g of glucose orally
4. A positive test is indicated when two or more of following venous plasma values are equaled or exceeded:

Fasting	105 mg/dL
1 hr	190 mg/dL
2 hr	165 mg/dL
3 hr	145 mg/dL

Premature Rupture of Membranes

Premature rupture of membranes (PROM) is the single most common diagnosis associated with preterm delivery.

I. Pathophysiology

A. **Premature rupture of membranes** is defined as rupture of membranes prior to the onset of labor.

B. **Preterm PROM** is defined as rupture of membranes prior to term.

C. **Prolonged rupture of membranes** consists of rupture of membranes for more than 24 hours.

D. **The latent period** is the time interval from rupture of membranes to the onset of regular contractions or labor.

E. Many cases of preterm PROM are caused by idiopathic weakening of the membranes, many of which are caused by subclinical infection. Other causes of PROM include hydramnios, incompetent cervix, abruptio placentae, and amniocentesis.

F. At term, about 8% of patients will present with ruptured membranes prior to the onset of labor.

II. Maternal and Neonatal Complications

A. Labor usually follows shortly after the occurrence of PROM. 90% of term patients and 50% of preterm patients go into labor within 24 hours after rupture.

B. Patients who do not go into labor immediately are at increasing risk of infection as the duration of rupture increases. Chorioamnionitis, endometritis, sepsis, and neonatal infections may occur.

C. Perinatal risks with preterm PROM are primarily complications from immaturity, including respiratory distress syndrome, intraventricular hemorrhage, patent ductus arteriosus, and necrotizing enterocolitis.

D. Premature gestational age is a more significant cause of neonatal morbidity than is the duration of membrane rupture.

III. Diagnosis of Premature Rupture of Membranes

A. Diagnosis is based on history, physical examination, and laboratory testing. The patient's history alone is correct in over 90% of patients.

B. Urinary leakage or excess vaginal discharge are sometimes mistaken for PROM.

C. **Sterile speculum exam** is the first step in confirming the suspicion of PROM. Digital examination should be avoided because it increases the risk of infection.

1. The general appearance of the cervix is assessed visually, and prolapse of the umbilical cord or a fetal extremity should be excluded. Cultures for group B streptococcus, gonorrhea, and chlamydia are obtained.

2. A pool of fluid in the posterior vaginal fornix supports the diagnosis of PROM.

3. The presence of amniotic fluid is confirmed by nitrazine testing for an alkaline pH. Amniotic fluid causes nitrazine paper to turn dark blue because the pH is above 6.0-6.5. Nitrazine may be false-positive with contamination from blood, semen, or vaginitis.

4. If pooling and nitrazine are both non-confirmatory, a swab from the posterior fornix should be smeared on a slide, allowed to dry, and examined under a microscope for "ferning," indicating amniotic fluid.

5. Ultrasound is useful to confirm the diagnosis, but oligohydramnios may be caused by other disorders besides PROM.

IV. Assessment of PROM

A. The gestational age must be carefully assessed. Menstrual history, prenatal exams, and previous sonograms are reviewed. An ultrasound examination should be performed.

B. The patient should be evaluated for the presence of chorioamnionitis

(fever, leukocytosis, maternal and fetal tachycardia, uterine tenderness, foul-smelling vaginal discharge). Fever (temperature over 38°C) is indicative of chorioamnionitis.

C. The patient should be evaluated for labor, and a sterile speculum examination should assess cervical change.

D. The fetus should be evaluated with heart rate monitoring because PROM increases the risk of umbilical cord prolapse and fetal distress caused by oligohydramnios.

V. Management of PROM

A. Term Patients

1. At 36 weeks and beyond, management of PROM consists of delivery. Patients in active labor should be allowed to progress.

2. Patients with chorioamnionitis, who are not in labor, should be immediately induced with oxytocin (Pitocin).

3. Patients who are not yet in active labor (in the absence of fetal distress, meconium, or clinical infection) may be discharged for 48 hours, and labor usually follows. If labor has not begun within a reasonable time after rupture of membranes, induction with oxytocin (Pitocin) is appropriate. Use of prostaglandin E2 is safe for cervical ripening.

B. Preterm Patients

1. Preterm patients with PROM prior to 36 weeks are managed expectantly. Delivery is delayed for the patients who are not in labor, not infected, and without evidence of fetal distress.

2. Patients should be monitored for infection. Cultures for gonococci, Chlamydia, and group B streptococci are obtained. Symptoms, vital signs, uterine tenderness, odor of the lochia, and leukocyte counts are monitored.

3. Suspected occult chorioamnionitis is diagnosed by amniocentesis for Gram stain and culture, which will reveal gram positive cocci in chains.

4. Ultrasound examination should be performed to detect oligohydramnios.

5. In the patient with a positive cervicovaginal culture for group B streptococcus or gonococcus, treatment with antibiotics is initiated, and follow-up cultures are repeated until delivery.

a. Ampicillin 1-2 g IV q6h or 500 mg PO q6h for 10 days **OR**

b. Erythromycin 250-500 mg PO qid.

6. Prolonged continuous fetal heart rate monitoring in the initial assessment should be followed by frequent fetal evaluation. Continuous fetal heart rate monitoring is resumed as soon as labor begins.

7. Premature labor is the most common outcome of preterm PROM. Tocolytic drugs are often used; however, corticosteroids have not been shown to be of benefit in accelerating fetal pulmonary maturity in preterm PROM.

8. Expectant management consists of in-hospital observation. Delivery indicated for chorioamnionitis, irreversible fetal distress, or premature labor. Once gestation reaches 36 weeks, the patient may be man-

aged as any other term patient with PROM. Another acceptable option is to evaluate the fetus at less than 36 weeks for pulmonary maturity and expedite delivery once maturity is documented by testing of amniotic fluid collected by amniocentesis or from the vagina.

9. A lecithin/sphingomyelin ratio of >2 and a positive phosphatidylglycerol test indicate fetal lung maturity.

C. Previable or Preterm PROM

1. In patients in whom membranes rupture very early in pregnancy (eg, <25 weeks). There is a relatively low likelihood (<25%) that a surviving infant will be delivered, and infants that do survive will deliver very premature and suffer significant morbidity.
2. **Fetal Deformation Syndrome.** The fetus suffering from prolonged early oligohydramnios may sometimes have pulmonary hypoplasia, facial deformation, and limb contractures and deformity.
3. Termination of pregnancy is advisable if the gestational age is early.
4. If the patient elects to continue the pregnancy, expectant management with pelvic rest at home is reasonable.

D. Chorioamnionitis

1. Chorioamnionitis requires delivery (usually vaginally), regardless of the gestational age.
2. **Antibiotic Therapy**
   a. Ampicillin 2 gm IV q4-6h **AND**
   b. Gentamicin 100 mg (2 mg/kg) IV load, then 100 mg (1.5 mg/kg) IV q8h.

Preterm Labor

Preterm labor is defined as regular uterine contractions with progressive cervical change or regular uterine contractions with a cervix that is 2 cm dilated and 80% effaced at less than 37 weeks gestation. Preterm labor is a major cause of preterm delivery. Preterm birth is the cause of 80% of neonatal deaths that are not due to congenital malformations.

I. Etiology and Epidemiology

A. Predisposing Factors

1. The cause of most cases of preterm labor is unknown. Risk factors include low socioeconomic status, nonwhite race, maternal age of 18 years or less or of 40 years or more, and low prepregnancy weight.
2. Multiple gestations account for 10% of all preterm births even though they account for only 1.1% of all pregnancies.
3. A history of one previous preterm birth is associated with a recurrence risk of 17-37%.
4. Women who have experienced one or more spontaneous second-trimester abortion are at increased risk for subsequent preterm deliveries.
5. Maternal smoking, cocaine use, and lack of prenatal care are

associated with preterm delivery.

6. Other conditions that lead to preterm delivery include preterm premature rupture of membranes, maternal complications, and antepartum fetal compromise or death.

B. Uterine Causes of Prematurity

1. Uterine malformations (unicornuate or bicornuate uterus) increase the risk for preterm delivery.
2. Cervical incompetence affects 0.1-2% of all pregnancies. It presents as painless cervical dilation and premature loss.

C. Infectious Causes of Prematurity

1. Maternal genital tract colonization and infection are important causes of preterm births.
2. An increased rate of preterm delivery occurs in women with cervical colonization with group B streptococci, Neisseria gonorrhoeae, Chlamydia trachomatis, Ureaplasma urealyticum, Treponema pallidum, Trichomonas vaginalis, or Gardnerella vaginalis.

II. Clinical Evaluation of Preterm Labor

A. The frequency of uterine contractions should be assessed and contributing causes such as infection or preterm rupture of membranes should be sought.

B. Gestational age should be confirmed (by ultrasound if necessary) and cervical dilatation and effacement assessed. The diagnosis of preterm labor requires regular uterine contractions with progressive cervical change or regular uterine contractions with a cervix that is 2 cm dilated and 80% effaced at less than 37 weeks gestation.

C. Fetal well-being should be assured with a biophysical profile.

III. Management of Preterm Labor

A. Tocolysis

1. Tocolytic therapy is usually initiated in the presence of regular uterine contractions with documentation of cervical change (effacement or dilatation). Cervical dilatation of at least 3 cm is associated with less effective treatment.
2. Patients with more advanced cervical dilatation may benefit from tocolytic therapy if it results in treatment with corticosteroids to reduce neonatal respiratory distress syndrome.
3. Tocolytic therapy is initiated for gestations prior to 34 weeks of gestation. However, the management of preterm labor at 34-37 weeks should be individualized.
   a. The survival rate for babies born at 34 weeks of gestation is within 1% of the survival rate beyond 37 weeks. Neonatal morbidity at 34-36 weeks is usually less severe, and rarely causes long-term sequelae.
   b. Assessment of fetal lung maturity can help to determine the appropriate treatment between 34 and 37 weeks of gestation.
4. **Contraindications to Tocolysis for Preterm Labor**. Acute fetal distress, chorioamnionitis, eclampsia or severe preeclampsia, fetal demise, fetal maturity, maternal hemodynamic instability.
5. Tocolysis usually consists of intravenous magnesium sulfate to

suppress contractions, followed by maintenance therapy with oral nifedipine until 36 weeks.

B. Magnesium Sulfate

1. Magnesium sulfate is the tocolytic of choice for intravenous therapy. It is 70-90% effective in achieving 2-3 days of tocolysis.
2. **Dosage**
   a. 6 g of $MgSO_4$ solution is given IV over 15-20 min, then of 2 g/h is infused. The infusion rate is increased by 1 g/hour until successful tocolysis or a maximum of 4-5 g/h is reached.
   b. $MgSO_4$ tocolysis is maintained for 12-24 hours when successful.
   c. $MgSO_4$ infusion is tapered by 1 g/hour increments when ending therapy, and then discontinued after the 2 g/hour dosage maintains tocolysis.
3. Total fluid intake should be limited to 3000 mL/day during intravenous $MgSO_4$ tocolysis.
4. **Monitoring of Intravenous Therapy**
   a. Deep tendon reflexes and vital signs are chocked every 4 hours. Intake and output are monitored every 4 hours.
   b. Magnesium levels are not necessary unless high doses are used or if toxicity is suspected. Therapeutic serum level is 4-8 mEq/L
5. **Side Effects.** Minor side effects include flushing, increased warmth, headaches, blurred vision, nausea, nystagmus, lethargy, hypothermia, urinary retention, and fecal impaction.
6. **Contraindications.** Heart block, myasthenia gravis, myocardial damage; caution in renal impairment.
7. **Magnesium Sulfate Toxicity**
   a. Loss of maternal patellar reflexes occurs at levels of 7-10 mEq/L
   b. Respiratory depression occurs at levels of 10-12 mEq/L
   c. Maternal tetany, profound hypotension, and cardiac arrest develop at higher levels.
   d. Magnesium toxicity is treated with calcium gluconate 10% solution, 1 g IV.

C. Nifedipine

1. Nifedipine, a calcium channel blocker, is 75% effective in stopping pre-term labor, and it is equal in efficacy to magnesium sulfate.
2. Nifedipine is the drug of choice for oral maintenance prevention of preterm labor.
3. **Maternal Side Effects.** An insignificant decrease in blood pressure occurs in 14-41% of pregnancies. Nausea, flushing, headache, and dizziness are common. Hepatotoxicity has been reported.
4. **Loading dose.** 30 mg orally plus an additional 20 mg po in 90 minutes.
5. **Maintenance Dosage.** 10-20 mg PO every 4-12 hours until 36 weeks.

D. Beta-agonist Therapy--Ritodrine and Terbutaline

1. Beta-agonist are not commonly used because of side effects.
2. Beta-agonists primarily stimulate beta-2 receptors of the uterus and of the heart.

3. **Tachyphylaxis.** Chronic therapy results in a reduction in tocolytic efficacy.
4. Terbutaline has similar efficacy as ritodrine. Terbutaline can be given SQ at a dose of 250 mcg every three hours.
5. Ritodrine usually may be given IV at an initial rate of 50-100 mcg/min and increased 50 mcg/min every 15-20 minutes until contractions have stopped.

E. Indomethacin

1. Indomethacin is a prostaglandin synthesis inhibitor that is equal to magnesium sulfate in effectiveness, but it has more side effects.
2. Indomethacin may prolong bleeding time, can cause renal dysfunction, and can exacerbate hypertension in chronically hypertensive women.
3. **Relative Maternal Contraindications.** Vaginal bleeding, coagulation disorders, renal disease, poorly controlled hypertension, active peptic ulcer disease, aspirin-induced allergy.
4. **Fetal and Neonatal Complications.** Oligohydramnios, constriction of the ductus arteriosus, necrotizing enterocolitis, intracranial hemorrhage, patent ductus arteriosus, renal dysfunction.
5. **Fetal Contraindications to Indomethacin:** Intrauterine growth retardation, oligohydramnios, ductal dependent cardiac defects, twin-twin transfusion syndrome, chorioamnionitis.

IV. Adjunctive Therapy for Preterm Labor

A. Corticosteroid Therapy

1. Corticosteroids are used for induction of fetal lung maturity. Antenatal corticosteroids reduce fetal mortality, respiratory distress syndrome, and intraventricular hemorrhage.
2. All women between 24 and 34 weeks of pregnancy, at risk for preterm delivery, should be given antenatal corticosteroids unless there is evidence of chorioamnionitis. Optimal benefits begin 24 hours after initiation of therapy and last 7 days.
3. Betamethasone (Celestone) 12 mg IM for 2 doses, 24 hours apart

B. Bed Rest is controversial, but decreased activity is probably prudent.

Third-Trimester Bleeding

Third-trimester bleeding occurs in 4% of all pregnancies. In 50% of cases, vaginal bleeding is secondary to placental abruption or placenta previa.

I. Clinical Evaluation of Late-pregnancy Bleeding

A. History of trauma or pain, and the amount and character of the bleeding are assessed.

B. Physical Examination

1. Vital signs and pulse pressure are measured. Hypotension and tachycardia are signs of serious hypovolemia.

2. Fetal heart rate pattern and uterine activity are assessed.
3. Ultrasound examination of the uterus, placenta, and fetus is completed.
4. Speculum and digital pelvic examination should not be done until placenta previa has been excluded.

C. Laboratory Evaluation

1. **Hemoglobin** and hematocrit.
2. **INR, partial thromboplastin time, platelet count, fibrinogen level, and fibrin split products** are obtained when placental abruption is suspected or if there has been significant hemorrhage.
3. **A red-top tube** of blood is used to perform a bedside clot test.
4. **Blood type** and cross-match.
5. **Urinalysis** for hematuria and proteinuria.
6. The **Apt test** is used to distinguish maternal or fetal source of bleeding. (Vaginal blood is mixed with an equal part 0.25% sodium hydroxide. Fetal blood remains red; maternal blood turns brown.)
7. **Kleihauer-Betke test** of maternal blood is used to quantify fetal to maternal hemorrhage.

II. Placental abruption (abruptio placentae) is defined as complete or partial placental separation from the decidua basalis after 20 weeks gestation.

A. Placental abruption occurs in 1 in 100 deliveries.

B. Factors Associated with Placental Abruption

1. Preeclampsia and hypertensive disorders
2. History of placental abruption
3. High multiparity
4. Increasing maternal age
5. Trauma
6. Cigarette smoking
7. Illicit drug use (especially cocaine)
8. Excessive alcohol consumption
9. Preterm premature rupture of the membranes
10. Rapid uterine decompression after delivery of the first fetus in a twin gestation or rupture of membranes with polyhydramnios
11. Uterine leiomyomas

C. Diagnosis of Placental Abruption

1. Abruption is characterized by vaginal bleeding, abdominal pain, uterine tenderness, and uterine contractions.
   - **a.** Vaginal bleeding is visible in 80%; bleeding is concealed in 20%.
   - **b.** Pain is usually of sudden onset, constant, and localized to the uterus and lower back.
   - **c.** Localized or generalized uterine tenderness and increased uterine tone are found with severe placental abruption.
   - **d.** An increase in uterine size may occur with placental abruption when the bleeding is concealed, and it may be detected by serial measurements of abdominal girth and fundal height.
   - **e.** Amniotic fluid may be bloody.
   - **f.** Fetal monitoring may detect distress.
   - **g.** Placental abruption may cause preterm labor.

2. **Uterine contractions** by tocodynamometry is the most sensitive indicator of abruption.
3. **Laboratory Findings** include proteinuria and a consumptive coagulopathy, characterized by decreased fibrinogen, prothrombin, factors V and VIII, and platelets. Fibrin split products are elevated.
4. **Ultrasonography.** The sensitivity of ultrasonography in detecting placental abruption is only 15%.

D. Management of Placental Abruption

1. **Mild Placental Abruption**
   - **a.** If maternal stability and reassuring fetal surveillance are assured and the fetus is immature, close expectant observation with fetal monitoring is justified.
   - **b.** Maternal hematologic parameters are monitored and abnormalities corrected.
   - **c.** Tocolysis with magnesium sulfate is initiated if the fetus is immature.
2. **Moderate to Severe Placental Abruption**
   - **a.** Shock is aggressively managed.
   - **b. Coagulopathy**
     (1) Blood is transfused to replace blood loss.
     (2) Clotting factors may be replaced using cryoprecipitate or fresh-frozen plasma. One unit of fresh-frozen plasma increases fibrinogen by 10 mg/dL. Cryoprecipitate contains 250 mg fibrinogen/unit; 4 gm (15-20 U) is an effective dose.
     (3) Platelet transfusion is indicated if the platelet count is less than 50,000/mcL. One unit of platelets raises the platelet count 5000-10,000/mcL; 4 to 6 U is the smallest useful dose.
   - **c. Oxygen** should be administered and urine output monitored with a Foley catheter.
   - **d.** Vaginal delivery is expedited in all but the mildest cases once the mother has been stabilized. Amniotomy and oxytocin (Pitocin) augmentation may be used. Cesarean section is indicated for fetal distress, severe abruption, or failed trial of labor.

III. Placenta previa occurs when any part of the placenta implants in the lower uterine segment. It is associated with risk of serious maternal hemorrhage.

A. Placenta previa occurs in 1 in 200 pregnancies. Ninety percent of placenta previas diagnosed in the second trimester resolve spontaneously.

B. Total placenta previa occurs when the internal cervical os is completely covered by placenta.

C. Partial placenta previa occurs when part of the cervical os is covered by placenta.

D. Marginal placenta previa occurs when the placental edge is located within 2 cm of the cervical os.

E. Clinical Evaluation

1. Placenta previa presents with a sudden onset of painless vaginal bleeding in the second or third trimester. The peak incidence occurs at 34 weeks. The initial bleeding usually resolves spontaneously and

then recurs later in pregnancy.

2. One fourth of patients present with bleeding and uterine contractions.

F. Ultrasonography is accurate in diagnosing placenta previa.

G. Management of Placenta Previa

1. In a pregnancy ≥36 weeks with documented fetal lung maturity, the neonate should be immediately delivered by cesarean section.
2. Low vertical uterine incision is probably safer in patients with an anterior placenta. Incisions through the placenta should be avoided.
3. If severe hemorrhage jeopardizes the mother or fetus, cesarean section is indicated regardless of gestational age.
4. Expectant management is appropriate for immature fetuses if bleeding is not excessive, and maternal physical activity can be restricted, and intercourse and douching can be prohibited, and the hemoglobin can be maintained at ≥10 mg/dL.
5. Rh immunoglobulin is administered to Rh-negative-unsensitized patients.
6. Delivery is indicated once fetal lung maturity has been documented.
7. Tocolysis with magnesium sulfate may be used with caution.

IV. Cervical Bleeding

A. Cytologic sampling is necessary.

B. Bleeding can be controlled with cauterization or packing.

C. Bacterial and viral cultures are sometimes diagnostic.

V. Cervical Polyps

A. Bleeding is usually self-limited.

B. Trauma should be avoided.

C. Polypectomy may control bleeding and yield a histologic diagnosis.

VI. Bloody show is a frequent benign cause of late third trimester bleeding. It is characterized by blood-tinged mucus associated with cervical change.

Hypertension in Pregnancy

Hypertension occurs in 6-10% of pregnancies, and it causes 15% of maternal deaths. Maternal hypertension causes perinatal morbidity and mortality secondary to direct fetal effects and iatrogenic preterm delivery. The cause of pregnancy induced hypertension is unknown, and the disease process is reversed only by delivery.

I. Terminology

A. Two distinct entities are commonly encountered in pregnant women: chronic hypertension and pregnancy-induced hypertension (PIH).

B. These two conditions may coexist; in fact, the risk of developing PIH is significantly increased in women with underlying chronic hypertension.

II. ACOG Classification of Hypertensive Diseases in Pregnancy

A. Chronic Hypertension is defined as blood pressure ≥140/90 at <20 weeks of gestation.

B. Pregnancy Induced Hypertension is defined as a sustained blood

pressure increase to levels of 140/90 at ≥20 weeks gestation.

C. **Superimposed Pregnancy-Induced Hypertension** is defined as coexistence of chronic hypertension and pregnancy-induced hypertension.

D. **Clinical Manifestations of Severe Disease in Patients with PIH**

1. Blood pressure >160-180 mm Hg systolic or >110 mm Hg diastolic
2. Proteinuria >5 g/24 h (normal <300 mg/24 h)
3. Elevated serum creatinine
4. Generalized seizures (eclampsia)
5. Pulmonary edema
6. Oliguria <500 mL/24 hours
7. Microangiopathic hemolysis
8. Thrombocytopenia
9. Hepatocellular dysfunction (elevated alanine aminotransferase, aspartase aminotransferase)
10. Intrauterine growth retardation or oligohydramnios
11. **Symptoms suggesting significant end-organ involvement:** headache, visual disturbances, or epigastric or right-upper quadrant pain

III. Pregnancy Induced Hypertension

A. **Manifestations of Pregnancy-induced Hypertension**

1. **Preeclampsia** occurs when renal involvement leads to proteinuria; occurs in 5-7% of the general population.
2. **Eclampsia** occurs when central nervous system involvement leads to seizures. The incidence is 0.2-0.3% in patients with preeclampsia.
3. **HELLP syndrome** (hemolysis, elevated liver enzymes and low platelets) occurs when hematologic and hepatic manifestations are present.

Risk Factors for Pregnancy Induced Hypertension

Factor	Risk Ratio
Nulliparity	3:1
Age >40 y	3:1
African race	1.5:1
Family history of pregnancy-induced hypertension	5:1
Chronic hypertension	10:1
Chronic renal disease	20:1
Diabetes mellitus	2:1
Twin gestation	4:1

B. Hematologic Effects

1. The most frequent hematologic effect of PIH is plasma volume contraction, which can result in decreased end-organ perfusion and a rise in hematocrit.
2. Thrombocytopenia is the most frequent hematologic abnormality in PIH.
3. A variant of severe PIH is the syndrome of hemolysis, thrombocytopenia, and elevated hepatic transaminase levels, known as the HELLP syndrome.

C. Renal Function

1. Decreased glomerular filtration rate and proteinuria (urine protein exceeding 300 mg/24 hours) are common in PIH, and all patients exhibit sodium retention.
2. The results of a random dipstick assessment of proteinuria may not correlate with those of a 24-hour urine collection.

D. Neurologic Function

1. Hyperreflexia is commonly seen in patients with PIH.
2. In severe cases, generalized tonic-clonic seizures occur, which can be fatal.

E. Other Organ Involvement

1. Pulmonary edema can occur in patients with PIH.
2. Elevated hepatic transaminase levels reflect hepatocellular damage.

F. Effects on the Fetus

1. The decreased placental perfusion in PIH results in increased perinatal morbidity and mortality.
2. The incidence of intrauterine growth retardation (IUGR) and placental abruption are increased.

IV. Management of Chronic Hypertension

A. Elevation of blood pressure may cause intrauterine growth retardation and fetal death.

B. Pharmacologic treatment is indicated if blood pressure is persistently >150 mm Hg systolic or >105 mm Hg diastolic. The goal of treatment is a systolic of 130-140 mm Hg and a diastolic of 90-100 mm Hg.

C. Patients with chronic hypertension who conceive while taking antihypertensive medications, except angiotensin-converting enzyme inhibitors, should continue these medications during pregnancy.

1. **Antepartum Management**
   a. **High-risk Hypertension Characteristics**
      (1) Maternal age > 40
      (2) Duration of hypertension >15 years
      (3) Severe hypertension: Systolic pressure >160 mm Hg or diastolic pressure >110 mm Hg early in pregnancy
      (4) Diabetes
      (5) Renal disease
      (6) Collagen vascular disease
      (7) Cardiomyopathy
      (8) Coarctation of the aorta
      (9) Pheochromocytoma

b. Nutritional/lifestyle counseling includes weight gain, attention to excessive salt intake, avoidance of smoking and illicit drugs.

2. **Baseline Studies**
   a. EKG
   b. Baseline blood chemistry including serum creatinine and uric acid levels.
   c. 24-hour urine collection for protein and creatinine clearance is done if there is history of renal impairment or if serum creatinine is abnormal.
   d. Specific tests as clinically indicated may include thyroid screening, ANA, glucose screen, urinary metanephrines, serum catecholamines.
3. **Second and Third Trimesters Management**
   a. Ultrasound at 18 weeks to confirm gestational age and evaluate fetal anatomy.
   b. Prenatal visits every 1-2 weeks for high-risk patients.
   c. Self-determination of blood pressure at home.
   d. Antihypertensive therapy if blood pressure is persistently >150 mm Hg systolic or > 105 mm Hg diastolic
   e. 24-hour urine collection if BP rises
   f. Hospitalization if superimposed preeclampsia is suspected because of proteinuria.

D. **Antihypertensive Therapy.** If therapy is initiated during gestation, alpha-methyldopa (Aldomet), 250 mg PO tid (up to 1 gm qid), is a first-line agent because of extensive experience and fetal safety. Nifedipine, 20 mg PO q4h, or labetalol, 600 mg PO qid, are also acceptable alternatives.

E. In pregnant patients taking beta-blocking agents, fetuses should be monitored for intrauterine growth retardation.

F. **Angiotensin-converting enzyme inhibitors** may be associated with fetal hypocalvaria, renal failure, oligohydramnios, arid fetal, and neonatal death. Women who conceive while using such agents should discontinue them immediately.

G. **Diuretics** should not be initiated during pregnancy because plasma volume reduction may have adverse fetal effects. Patients who conceive while on chronic diuretic therapy may safely continue these agents.

H. **Women with chronic hypertension** are at increased risk for having a fetus with growth retardation.

1. Serial sonography and antepartum fetal heart rate assessment is used to monitor fetal well-being.
2. **Nonstress Testing:** In patients with chronic hypertension, the nonstress test is performed weekly after 32 to 34 weeks, 2-3 times a week or more, the amniotic fluid index is performed once or twice a week.
3. Ultrasonic assessment of fetal growth is often initiated at 30 to 32 weeks, following a baseline study at 18 to 24 weeks.

I. **Induction of labor** at term is appropriate for the woman with chronic hypertension and a favorable cervix.

V. Intrapartum Management of Preeclampsia and Pregnancy-Induced Hypertension

A. Blood Pressure Control

1. When blood pressure exceeds 110 mm Hg diastolic or 160 mm Hg systolic, consideration should be given to antihypertensive agents.
2. The goal of treatment is a systolic of 130-140 mm Hg and a diastolic of 90-100 mm Hg.
3. Hydralazine is the drug of choice; given IV as a 5-10-mg bolus as often as every 20 minutes as necessary.
4. Labetalol, 20 mg, given IV as often as every 10 minutes to a maximum dose of 300 mg, is an acceptable substitute.
5. Unresponsive blood pressure can occasionally require sodium nitroprusside, with central hemodynamic monitoring.

B. Prevention of Seizures with Magnesium Sulfate

1. When delivery is indicated, parenteral magnesium sulfate is administered to all patients with hypertension at term to prevent seizures.
2. **Loading bolus.** 6 g IV over 15-20 minutes, followed by continuous infusion of 2 g/h.
3. Infusion of magnesium sulfate should be discontinued and a serum magnesium level obtained in any patient with loss of deep tendon reflexes, respiratory rate less than 12 per minute, and a decrease in urinary output to below 25 mL/h.
4. **Therapeutic range for magnesium:** 4-8 mg/dL.
5. When symptomatic magnesium overdose is suspected (apnea, obtundation), it can be reversed by the intravenous administration of 10% calcium gluconate, 10 mL IV over 2 minutes.
   a. Mechanical ventilation may be necessary until plasma levels have been reduced.
6. Other anti-seizure agents are considered when the seizure is not controlled with $MgSO_4$ or when $MgSO_4$ is contraindicated (renal impairment, myasthenia gravis).
7. Magnesium does not substantially affect blood pressure; therefore, if blood pressure control is necessary, a antihypertensive agent is necessary.
8. Magnesium prophylaxis must be continued in the immediate postpartum period, as the risk of seizures is highest in the intrapartum stage and during the first 24 hours following delivery.

C. Delivery is the only definitive treatment for PIH. Delivery is indicated if the patient is $\geq$37 weeks.

D. Management of Preterm Patients with Mild PIH between 32-37 weeks

1. Conservative management is generally indicated with monitoring of blood pressure, proteinuria, renal and hepatic function, and platelet count.
2. Serial sonography for fetal growth and antepartum assessment of fetal well-being are monitored.
3. Deterioration in fetal or maternal condition requires delivery. Severe

preeclampsia in a fetus of 32 weeks or more requires delivery.

E. Delivery

1. Cervical ripening with prostaglandin E2 gel is used if the cervix is unripe.
2. Vaginal delivery with aggressive induction is necessary; however, seriously ill patients with an unfavorable cervix should receive cesarean delivery rather than a long induction of labor.

VI. Conservative Management of Preterm, Severe Preeclampsia

A. Conservative management is justifiable only if it is beneficial to the neonate. At 24-32 weeks, each week confers benefit to the neonate.

B. The use of corticosteroids is appropriate; however, the health of the mother or the fetus should not be jeopardized by delaying delivery solely for this reason.

C. Exclusion Criteria for Conservative Management

1. Gestational age >34 weeks or >32 weeks with lung maturity
2. Biophysical Profile <6 or non-reassuring fetal heart tracing
3. Amniotic fluid index $\leq$2
4. Estimated fetal weight $\leq$5th percentile
5. Uncontrolled hypertension
6. Eclampsia
7. HELLP syndrome
8. Swollen, tender liver
9. Pulmonary edema
10. Renal compromise
11. Unremitting headache or visual change

D. After the diagnosis of severe preeclampsia, the patient should be admitted for observation in the labor and delivery unit for 12-24 hours for assessment and stabilization.

E. Intravenous magnesium sulfate is given for seizure prophylaxis.

F. Blood pressure is controlled with antihypertensive agents such as oral hydralazine (Apresoline) or labetalol.

G. CBC with platelet count, serum creatinine, liver transaminases, 24 hour urine collection, biophysical profile, and estimated fetal weight are assessed.

H. If the patient is considered suitable for conservative management:

1. Glucocorticoids are administered and magnesium sulfate is discontinued.
2. The patient is transferred to the ward, and blood pressure is monitored q4-6 hours.
3. Platelet counts and liver function tests are measured daily.
4. Fluid balance is monitored.
5. Estimated fetal weight is determined every 2 weeks.

I. Criteria for Intervention

1. Any evidence of worsening maternal or fetal conditions.
2. Rise in liver function tests
3. Thrombocytopenia
4. Unremitting headache as defined by persistent headache after acetaminophen and/or adequate blood pressure control

5. Onset of labor
6. Documented fetal pulmonary maturity at 33-34 weeks by amniocentesis.

Herpes Simplex Virus Infections in Pregnancy

Transmission of HSV occurs by virus direct contact. 5-10% of population has a history of symptomatic HSV-2 genital herpes.

I. Clinical Presentation

- **A. Primary Genital Herpes** is caused by initial infection with either HSV 1 or 2, without prior exposure. Systemic symptoms include headache, fever, malaise, and numerous bilaterally distributed genital lesions, and pain.
- **B. Non-primary First Episode** is the first clinical episode of HSV-1 or 2 in a patient with prior exposure to the other vial serotype. The episode is usually less severe.
- **C. Recurrent Herpes** is caused by reactivation of latent virus. The mean time interval to a subsequent recurrence is 40-60 days. Most patients have 4-6 recurrence per year.

II. Laboratory Diagnosis

- **A.** Viral culture requires one week.
- **B.** Monoclonal antibody on cytologic smears provides results in 3 hours. It is 92% sensitive and 94% specific.
- **C.** Polymerase chain reaction (PCR) is more sensitive.

III. Genital Herpes in Pregnancy

- **A.** Pregnancy does not influence the recurrence risk of 0.1-4.0%.
- **B. Neonatal Syndromes**
  1. Forms of infection include infection of skin, eye, or mouth only; CNS infection; and disseminated disease.
  2. Neonatal infection may develop after delivery from mothers with either symptomatic or asymptomatic infection. Neonatal infection may develop after primary, nonprimary, or recurrent maternal infection.
  3. Newborn infection is mainly seen in primary maternal infections; up to 50% of fetuses may be affected.
  4. Infection of the newborn causes skin lesions in 92%, CNS lesions in 92%, and death in 31%.
  5. Neurologic sequelae occur in all survivors.

IV. Management HSV Infections in Pregnancy

- **A. Women with a History of Genital Herpes, but Without Lesions**
  1. Weekly prenatal cultures are of no use and should not be done.
  2. In the absence of genital herpetic lesions, vaginal delivery should be expected.
  3. In order to identify potentially exposed neonates, a culture for herpes virus may be obtained from the mother on the day of delivery or from the neonate.

B. Women with Herpetic Lesions of the Genital Tract at the Onset of Labor or Membrane Rupture

1. Cesarean delivery reduces the risk of neonatal herpes virus infection; however, vaginal birth is an option for women who are informed of the risks.
2. Ideally, cesarean section should be performed prior to, or within 4 to 6 hours of, membrane rupture, but cesarean delivery may be of benefit in preventing neonatal herpes regardless of duration of membrane rupture.

C. Recurrent Infection

1. Serial cultures taken at 3 to 5 day intervals may be obtained if a recurrent episode occurs at or near term, but prior to labor or membrane rupture.
2. The patient is examined with a speculum on admission to the labor and delivery suite.
3. Vaginal delivery is planned if no lesions are present. A culture of neonate and/or mother is completed in order to identify exposed neonates.
4. The method that prevents the most cases of neonatal herpes is prophylactic acyclovir (400 mg tid) given from 36 weeks to term, followed by cesarean delivery if genital herpes lesions are present.
5. Oral acyclovir prophylaxis is a more cost-effective means of preventing neonatal herpes than a strategy of cesarean delivery for all women presenting with genital herpes lesions.
6. The safety of acyclovir in pregnancy has not yet been determined, but toxicity has not been detected.

Dystocia and Augmentation of Labor

I. Normal Labor

A. First Stage of Labor

1. The first stage of labor consists of the period from the onset of labor until complete cervical dilation (10 cm). This stage has been divided into the latent phase and the active phase.
2. **Latent Phase**
   - **a.** During the latent phase, uterine contractions are infrequent and irregular and result in only modest discomfort. They result in gradual effacement and dilation of the cervix.
   - **b.** A prolonged latent phase is on that exceeds 20 hours in the nullipara or one that exceeds 14 hours in the multipara.
3. **Active Phase**
   - **a.** The beginning of the active phase of labor occurs when the cervix reaches 3-4 cm of dilatation.
   - **b.** The active phase of labor is characterized by an increased rate of cervical dilation and by descent of the presenting fetal part.

B. Second Stage of Labor

1. **The second stage of labor** consists of the period from complete cervical dilation (10 cm) until delivery of the infant. This stage is usually brief, averaging 20 minutes for parous women and 50 minutes for nulliparous women.
2. The duration of the second stage of labor is unrelated to perinatal outcome in the absence of a nonreassuring fetal heart rate pattern as long as progress occurs.

II. Abnormal Labor

A. Dystocia is defined as difficult labor or childbirth resulting from abnormalities of the cervix and uterus, the fetus, the maternal pelvis, or combinations of these factors.

B. Cephalopelvic disproportion is a disparity between the size of the maternal pelvis and the fetal head that precludes vaginal delivery. This condition can rarely be diagnosed in advance. The term "failure to progress" should no longer be used.

C. Slower-than-normal (protraction disorders) or complete cessation of progress (arrest disorder). These disorders require the parturient to have entered the active phase of labor.

III. Assessment of Labor Abnormalities

A. Labor Abnormalities Due to Uterine Contractility. The minimal uterine contractile pattern of women in spontaneous labor consists of 3 to 5 contractions in a 10-minute period.

B. Labor Abnormalities Due to Fetal Characteristics

1. Assessment of the fetus consists of estimating fetal weight and position. Estimations of fetal size, even those obtained by ultrasonography, are frequently inaccurate.
2. In the first stage of labor, the diagnosis of dystocia can not be made unless the active phase of labor and adequate uterine contractile forces have occurred.
3. Fetal anomalies such as hydrocephaly, encephalocele, and soft tissue tumors may obstruct labor. Fetal imaging should be considered when malpresentation or anomalies are suspected based on vaginal or abdominal examination or when the presenting fetal part is persistently high.

C. Labor Abnormalities Due to the Pelvic Passage

1. Inefficient uterine action should be corrected before attributing dystocia to a pelvic problem.
2. The bony pelvis is very rarely the factor that limits vaginal delivery of a fetus in cephalic presentation. Radiographic pelvimetry is of limited value in managing most cephalic presentations.
3. Clinical pelvimetry can only be useful to qualitatively identify the general architectural features of the pelvis.

IV. Augmentation of Labor

A. Uterine hypocontractility should be augmented only after both the maternal pelvis and fetal presentation have been assessed.

B. Contraindications to augmentation include placenta or vasa previa, umbilical cord prolapse, prior classical uterine incision, pelvic structural

deformities, or invasive cervical cancer.

C. Oxytocin (Pitocin)

1. The goal of oxytocin administration is to stimulate uterine activity that is sufficient to produce cervical change and fetal descent while avoiding uterine hyperstimulation and fetal compromise.
2. **Minimally effective uterine activity** is 3 contractions per 10 minutes averaging greater than 25 mm Hg above baseline. A maximum of 5 contractions in a 10-minute period with resultant cervical dilatation is considered adequate.
3. **Hyperstimulation** is characterized by more than five contractions in 10 minutes, contractions lasting 2 minutes or more, or contractions of normal duration occurring within 1 minute of each other.
4. Oxytocin is administered when a patient is progressing slowly through the latent phase of labor or has a protraction or an arrest disorder of labor, and when a hypotonic uterine contraction pattern is identified.
5. A pelvic examination should be performed at initiation of oxytocin infusion.
6. Oxytocin is usually diluted 10 units in 1 liter of normal saline IVPB.

Labor Stimulation with Oxytocin

Regimen	Starting Dose (mU/min)	Incremental Increase (mU/min)	Dosage Interval (min)	Maximum Dose (mU/min)
Low-Dose	0.5-1	1	30-40	20
High-Dose	6	6	15	40

7. **Management of Oxytocin-Induced Hyperstimulation**
   - **a.** The most common adverse effect is fetal heart rate deceleration associated with uterine hyperstimulation. Stopping or decreasing the dose of oxytocin may correct the abnormal pattern.
   - **b.** Additional measures may include changing the patient to the lateral decubitus position and administering oxygen or more intravenous fluid.
   - **c.** When restarting the oxytocin, it may be necessary to lower the dose.
   - **d.** If oxytocin-induced uterine hyperstimulation does not respond to conservative measures, intravenous terbutaline (0.125-0.25 mg) or magnesium sulfate (2-6 g in 10-20% dilution) may be used to stop uterine contractions.

Fetal Macrosomia

Excessive birth weight is associated with an increased risk of maternal and neonatal injury. Macrosomia refers to a fetus with an estimated weight of more than 4,500 grams, regardless of gestational age.

I. Diagnosis of Macrosomia

- **A.** Clinical estimates of fetal weight based on Leopold's maneuvers or fundal height measurements are unreliable and often inaccurate.
- **B.** Diagnosis of macrosomia requires ultrasound evaluation; however, estimation of fetal weight based on ultrasound is associated with a large margin of error.
- **C.** Maternal weight, height, previous obstetric history, fundal height, and the presence of gestational diabetes should be evaluated.

II. Factors Influencing Fetal Weight

- **A. Gestational Age.** Post-term pregnancy is a risk factor for macrosomia. At 42 weeks and beyond, 2.5% of fetuses weigh more than 4,500 g. Ten to twenty percent of macrosomic infants were post-term fetuses.
- **B. Maternal Weight.** Heavy women have a greater risk of giving birth to excessively large infants. Fifteen to thirty five percent of women who deliver macrosomic fetuses weigh 90 kg or more.
- **C. Multiparity.** Macrosomic infants are 2-3 times more likely to be born to parous women.
- **D. Macrosomia in a Prior Infant.** The risk of delivering an infant weighing more than 4,500 g is increased if a prior infant weighed more than 4,000 g.
- **E. Maternal Diabetes**
  1. Maternal diabetes increases the risk of fetal macrosomia and shoulder dystocia.
  2. Cesarean delivery is indicated when the estimated fetal weight exceeds 4,500 g.

III. Morbidity and Mortality

- **A. Abnormalities of Labor.** Macrosomic fetuses have a higher incidence of labor abnormalities and instrumental deliveries.
- **B. Maternal Morbidity.** Macrosomic fetuses have a two- to threefold increased rate of cesarean delivery.
- **C. Birth Injury**
  1. The incidence of birth injuries occurring during delivery of a macrosomic infant is much greater with vaginal than with cesarean birth. The most common injury is brachial plexus palsy, often caused by shoulder dystocia.
  2. The incidence of shoulder dystocia in infants weighing more than 4,500 g is 8-20%.
  3. Macrosomic infants also may sustain fractures of the clavicle or humerus.

IV. Management of Delivery

- **A.** If the estimated fetal weight is greater than 4500 gm in the nondiabetic

or greater than 4000 gm in the diabetic patient, delivery by cesarean section is indicated.

B. Management of Shoulder Dystocia

1. If a shoulder dystocia occurs, McRobert's maneuver (extreme hip flexion) should be done immediately.
2. If the shoulder remains impacted anteriorly, an ample episioproctotomy should be cut and the posterior arm delivered.
3. In almost all instances, one or both of these procedures will result in successful delivery. The Zavanelli maneuver consists of replacement of the fetal lead into the vaginal canal and delivery by emergency cesarean section.
4. Anesthesia assistance and an obstetric assistant should be summoned immediately.
5. Fundal pressure is not recommended because it often results in further impaction of the shoulder against the symphysis, it can result in uterine rupture, and it is associated with a high frequency of neonatal injury.

Post-term Pregnancy

A normal term pregnancy has a duration of 38 to 42 weeks. A post-term pregnancy is defined as a pregnancy that extends beyond 42 weeks. The incidence of post-term pregnancy is 3-12%.

I. Causes of Post-Term Pregnancy

- **A.** Incorrect dates account for two-thirds of the pregnancies designated "post-term" pregnancies.
- **B.** Some pregnancies will last more than 42 weeks and have no underlying abnormality.
- **C.** Post-term pregnancy is rarely associated with low estrogen levels, including anencephaly, fetal adrenal hypoplasia, absence of fetal pituitary, estrogen precursor deficiency, or placental sulfatase deficiency.

II. Complications of Post-Term Pregnancy

- **A. Perinatal mortality** increases after 40 weeks, and the rate doubles by 42 weeks; at 44 weeks the perinatal mortality rate is 4-6 times greater than the mortality rate of a term gestation. Maternal, fetal, and neonatal morbidity also increase after 42 weeks.
- **B. Maternal Complications**. The risk of cesarean birth more than doubles after 42 weeks gestation.
- **C. Neonatal complications** of post-term pregnancy include macrosomia, shoulder dystocia, brachial plexus injuries, and meconium aspiration.

III. Confirmation of Gestational Age

- **A. Ultrasound Confirmation of Gestational Age.** Ultrasound before 24 weeks is the best method of accurately dating a pregnancy. The crown-rump length is the single most accurate predictor of gestational age.
- **B. An early pelvic examination** (before 12 weeks) with size-dates

concordance confirms gestational age.

IV. Clinical Dating

A. Gestational age is measured from the first day of the last normal menstrual period.

B. The most reliable clinical predictor of gestational age is an accurately dated first day of last menstrual period. However, the date of last menstrual period is often inaccurate because 20-40% of women cannot recall this date, and even in women who do remember, the date may be unreliable.

C. Quickening, or the first perception of fetal movement by the mother, occurs at around 19 weeks in first pregnancies and at approximately 17 weeks in subsequent pregnancies.

D. Electronic Doppler can detect fetal heart sounds by 11 to 12 weeks.

Clinical Estimates of Gestational Age

Parameter	Gestational age (weeks)
Positive urine hCG	5
Fetal heart tones by Doppler	11 to 12
Quickening	
Primigravida	19
Multigravida	17
Fundal height at umbilicus	20

V. Antepartum Fetal Testing of Post-Term Pregnancies

A. In uncomplicated pregnancies that progress beyond 41 weeks of gestation, antepartum testing is recommended.

B. Fetal Movement Counting

1. Although fetal movement has been shown to correlate with fetal health, fetal movement counting (kick counts) alone is not sufficient to monitor fetal well-being.

2. It consist of having the mother lie on her side and count fetal movements. Perception of 10 distinct movements in a period of up to 2 hours is considered reassuring. After 10 movements have been perceived, the count may be discontinued.

C. Nonstress Testing

1. The nonstress test is considered to be reactive, or reassuring, when 2 or more fetal heart accelerations occur in relationship to fetal movements within a 20 minute period. A reactive nonstress test indicates that fetal oxygenation is adequate.

2. When the nonstress test is performed twice weekly, the false-negative rate decreases to 1.9 per 1,000.

3. Spontaneous variable decelerations on a nonstress test may indicate cord compression and should be evaluated with a biophysical profile.

D. Biophysical Profile

1. The biophysical profile is used to assess fetal status when the screening nonstress test is nonreactive or equivocal. The biophysical profile consists of a nonstress test and an ultrasound evaluation of fetal breathing, fetal movement, fetal tone, and amniotic fluid volume.
2. **Two points are assigned to each of the following variables**
   - **a.** A reactive nonstress test.
   - **b.** One or more episodes of rhythmic fetal breathing movement of 30 seconds or more in 30 minutes.
   - **c.** Three or more discrete body or limb movements in 30 minutes.
   - **d.** One or more episodes of extremity extension with return to flexion.
   - **e.** Detection of a single pocket of amniotic fluid exceeding 2 cm in two perpendicular planes.
3. A score of 8 to 10 is normal. A score of 4 to 6 is equivocal and requires fetal reevaluation within 12 to 24 hours or a contraction stress test. A biophysical profile score of zero to 2 strongly correlates with fetal hypoxemia and warrants immediate delivery.
4. A twice-weekly biophysical profile, with intervention for low amniotic fluid volume, decreases the false negative risk to zero per 1,000.
5. Amniotic fluid volume is measured by the amniotic fluid index. The AFI is determined by measuring the maximal vertical fluid pocket depth in centimeters in each of the four uterine quadrants. The volumes are added together to obtain the amniotic fluid index. After 41 weeks of gestation, the amniotic fluid index is low if it is less than 5 cm; it is borderline between 5 cm and 8 cm; and it is normal if greater than 8 cm.

Management of the Post-term Pregnancy

A. Induction of labor is recommended with a gestational age of 42 weeks or beyond with a favorable cervix.

B. **Stripping of the membranes**, starting at 38 weeks and repeated weekly, has also been shown to be an effective method of inducing labor in post-term women with a favorable cervix. Stripping of membranes is performed by placing a finger in the cervical os and circling 3 times in the plane between the fetal head and cervix.

C. Patients with an unripe cervix at 42 weeks and beyond

1. Delivery is indicated if the amniotic fluid index is less than 5 cm, a nonreactive non-stress test is identified, or if decelerations are identified on the nonstress test.
2. The patient should monitor fetal movement daily.
3. Expectant management after 42 weeks is appropriate with an unfavorable cervix and reassuring test results. A nonstress test and biophysical profile are obtained 2 times per week. If non-reassuring, consider contraction stress test or induction of labor with cervical ripening with prostaglandin E2.
4. Cesarean section for sonographically documented macrosomia $\geq$4500 gm.

Induction of Labor

Induction of labor consists of stimulation of uterine contractions before the spontaneous onset of labor for the purpose of accomplishing delivery.

I. Indications and Contraindications

A. Common Indications for Induction of Labor

1. Pregnancy-induced hypertension
2. Premature rupture of membranes
3. Chorioamnionitis
4. Suspected fetal jeopardy (eg, severe fetal growth retardation, isoimmunization)
5. Maternal medical problems (eg, diabetes mellitus, renal disease)
6. Fetal demise
7. Postterm pregnancy

B. Contraindications to Labor Induction or Spontaneous Labor

1. Placenta previa or vasa previa
2. Transverse fetal lie
3. Prolapsed umbilical cord
4. Prior classical uterine incision

C. Obstetric Conditions Requiring Special Caution During Induction

1. Multifetal gestation
2. Polyhydramnios
3. Maternal cardiac disease
4. Abnormal fetal heart rate patterns not requiring emergency delivery
5. Grand multiparity
6. Severe hypertension
7. Breech presentation
8. Presenting part above the pelvic inlet

D. A trial of labor with induction is not contraindicated in women with one or more previous low transverse cesarean deliveries.

II. Requirements for Induction

A. Labor should be induced only after the mother and fetus have been examined thoroughly, and after fetal maturity has been assured.

B. Criteria for Fetal Maturity

1. An ultrasound measurement of the crown-rump length, obtained at 6-11 weeks, supports a gestational age of 39 weeks or more.
2. An ultrasound scan, obtained at 12-20 weeks, confirms the gestational age of 39 weeks or more determined by history and physical examination.
3. Fetal heart tones have been documented for 30 weeks by Doppler.
4. 36 weeks have elapsed since a positive serum or urine pregnancy test was performed.

C. If one or more of these criteria are not met, amniocentesis is performed to document fetal maturity.

D. A cervical examination should be performed immediately before cervical ripening or oxytocin (Pitocin) infusion.

E. During induction of labor, uterine activity and fetal heart rate are monitored.

III. Cervical Ripening

A. In a significant proportion of postdate pregnancies, the condition of the cervix is unfavorable, and cervical ripening is necessary.

B. Prostaglandin E2

1. Prostaglandin E2 vaginal gel may be prepared and administered for cervical ripening as 5 mg in 10 cc gel intravaginal q4h.

2. Prostaglandin E2 gel is available in a 2.5-mL syringe that contains 0.5 mg of dinoprostone (Prepidil).

3. A prostaglandin vaginal insert (Cervidil, 10 mg of dinoprostone) provides a lower rate of release of medication (0.3 mg/h) than the gel. The vaginal insert has an advantage over the gel because it can be removed should hyperstimulation occur.

4. There is no difference in efficacy between vaginal or cervical routes. The vaginal route is much more comfortable to the patient.

5. The prostaglandin-induced cervical ripening process often induces labor that is similar to that of spontaneous labor. Prostaglandin E2 may enhance sensitivity to oxytocin (Pitocin).

6. Before initiating prostaglandin E2, a reassuring fetal heart rate tracing should be present, and there should be an the absence of regular uterine contractions (every 5 minutes or less).

7. After prostaglandin E2 intravaginal gel is placed, the patient is continuously monitored for 2 hours, then discharged.

8. Protocol for Administration

a. The patient should remain recumbent for at least 30 minutes.

b. Effects of prostaglandin E2 may be exaggerated with oxytocin (Pitocin); therefore, oxytocin induction should be delayed for 6-12 hours. If the patient continues to have uterine activity as a result of the prostaglandin E2 gel, oxytocin should be deferred or used with caution in low doses.

c. If there is insufficient cervical change with minimal uterine activity with one dose of prostaglandin E2, a second dose of prostaglandin E2 may be given 6-12 hours later.

9. Side Effects

a. The rate of uterine hyperstimulation is 1% for the intracervical gel.

b. When hyperstimulation occurs, it usually begins within 1 hour after the gel is applied. Pulling on the tail of the net surrounding the vaginal insert will usually reverse this effect.

c. Terbutaline, 250 mg SC or IV will rapidly stop hyperstimulation.

d. Maternal systemic effects from low-dose prostaglandin E2 (fever, vomiting, diarrhea) are negligible.

IV. Amniotomy

A. Artificial rupture of membranes is another method of labor induction. Routine early amniotomy results in a modest reduction in the duration of labor.

B. Before and after amniotomy the cervix should be palpated for the

presence of an umbilical cord, and the fetal heart rate should be assessed and monitored.

V. Oxytocin (Pitocin)

A. Oxytocin administration stimulates uterine activity. No physiologic difference between oxytocin-stimulated labor and natural labor has been found.

B. Administration

1. Oxytocin is diluted 10 units in 1 liter (10 mU/ mL) of normal saline solution.

2. Starting dosage is 0.5-2 mU/min, with increases of 1-2 mU/min increments, every 30-60 minutes.

3. A cervical dilation rate of 1 cm/h in the active phase indicates that labor is progressing sufficiently.

C. Side Effects

1. Uterine Hyperstimulation

a. The most common adverse effect is fetal heart rate deceleration associated with uterine hyperstimulation.

b. Decreasing the oxytocin dose rather than stopping it may correct the abnormal pattern.

c. Additional measures may include changing the patient to the lateral decubitus position, administering oxygen, or increasing intravenous fluid. When restarting the oxytocin, the dose should be lowered.

d. Use of oxytocin (Pitocin) may result in uterine hyperstimulation or rupture. Uterine hyperstimulation or a resting tone above 20 mm Hg between contractions can lead to fetal hypoxia.

2. Oxytocin does not cross the placenta; therefore, it has no direct effects on the fetus.

3. Hypotension is seen only with rapid intravenous injection of oxytocin.

Postpartum Hemorrhage

Obstetric hemorrhage is one of the three leading causes of maternal mortality. Postpartum hemorrhage has been defined as the loss of more than 500 mL of blood following delivery. However, the average blood loss in an uncomplicated vaginal delivery is about 500 mL, with 5% losing more than 1,000 mL.

I. Clinical Evaluation of Postpartum Hemorrhage

A. Causes of Postpartum Hemorrhage. Uterine atony, retained placental fragments, lower genital tract lacerations, uterine inversion, uterine rupture, coagulopathy.

B. Uterine atony is the most common cause of postpartum hemorrhage. Conditions associated with uterine atony include an overdistended uterus (eg, polyhydramnios, multiple gestation), rapid or prolonged labor, macrosomia, high parity, and chorioamnionitis.

C. Conditions Associated with Bleeding from Trauma include forceps

delivery, macrosomia, precipitous labor and delivery, and episiotomy.

D. Conditions Associated with Bleeding from Coagulopathy and Thrombocytopenia include abruptio placentae, amniotic fluid embolism, preeclampsia, coagulation disorders, autoimmune thrombocytopenia, and anticoagulants.

E. Conditions Associated with Uterine Rupture include previous uterine surgery, internal podalic version, breech extraction, multiple gestation, and abnormal fetal presentation. High parity is a risk factor for both uterine atony and rupture.

F. Uterine Inversion. Incomplete inversion is detected by abdominal vaginal examination, which will reveal a uterus with an unusual shape after delivery.

II. Management of Postpartum Hemorrhage

A. Following delivery of the placenta, the uterus should be palpated to determine whether atony is present. If atony is present, vigorous fundal massage should be administered. If bleeding continues despite uterine massage, it can often be controlled by bimanual uterine compression.

B. Genital tract lacerations should be suspected in patients who have a firm uterus, but who continue to bleed. The cervix and vagina should be inspected to rule out lacerations. If no laceration is found but bleeding is still profuse, the uterus should be manually examined to exclude rupture.

C. The placenta and uterus should be examined for retained placental fragments. Placenta accreta is usually manifest by failure of spontaneous separation.

D. Bleeding from non-genital areas (venous puncture sites) suggests coagulopathy. Laboratory tests that confirm coagulopathy include INR, partial thromboplastin time, platelet count, fibrinogen, fibrin split products, and a clot retraction test.

E. Medical Management of Postpartum Hemorrhage

1. An oxytocin (Pitocin) infusion is usually given routinely immediately after delivery to stimulate uterine firmness and diminish blood loss. 20 units of oxytocin in 1,000 mL of normal saline or Ringer's lactate is administered at 100 drops/minute. Oxytocin should never be given as a rapid bolus injection because of the potential for circulatory collapse.

2. If uterine massage and oxytocin are not effective in correcting uterine atony, methylergonovine 0.2 mg can be given IM, provided there is no hypertension. If hypertension is present, 15-methyl prostaglandin F2-alpha (Hemabate), one ampule (0.25 mg), can be given IM, with repeat injections every 20min, up to 4 doses; contraindicated in asthma.

Treatment of Postpartum Hemorrhage Secondary to Uterine Atony

Drug	Protocol
Oxytocin	20 U in 1,000 mL of lactated Ringer's solution or normal saline as IV infusion
Methylergonovine (Methergine)	0.2 mg IM
Prostaglandin (15 methyl PGF2-alpha [Prostin/15M])	0.25 mg as IM every 15-60 minutes as necessary

F. Volume Replacement

1. Patients with postpartum hemorrhage that is refractory to medical therapy require a second large-bore IV catheter. If the patient has had a major blood group determination and has a negative indirect Coombs test, type-specific blood may be given without waiting for a complete cross-match. Lactated Ringer's solution or normal saline is generously infused until blood can be replaced. Replacement consists of 3 mL of crystalloid solution per 1 mL of blood lost.
2. A Foley catheter is placed, and urine output is maintained at greater than 30 mL/h.

G. Surgical Management of Postpartum Hemorrhage. Patients in whom medical therapy fails may require ligation of the uterine or uteroovarian artery, infundibulopelvic vessels, or hypogastric arteries, or hysterectomy.

H. Management of Uterine Inversion

1. The inverted uterus should be immediately repositioned vaginally. Blood and/or fluids are administered.
2. If the placenta is still attached, it should not be removed until the uterus has been repositioned.
3. Uterine relaxation can be achieved with a halogenated anesthetic agent. Terbutaline is also useful for relaxing the uterus.
4. Following successful uterine repositioning and placental separation, oxytocin (Pitocin) is given to contract the uterus.

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